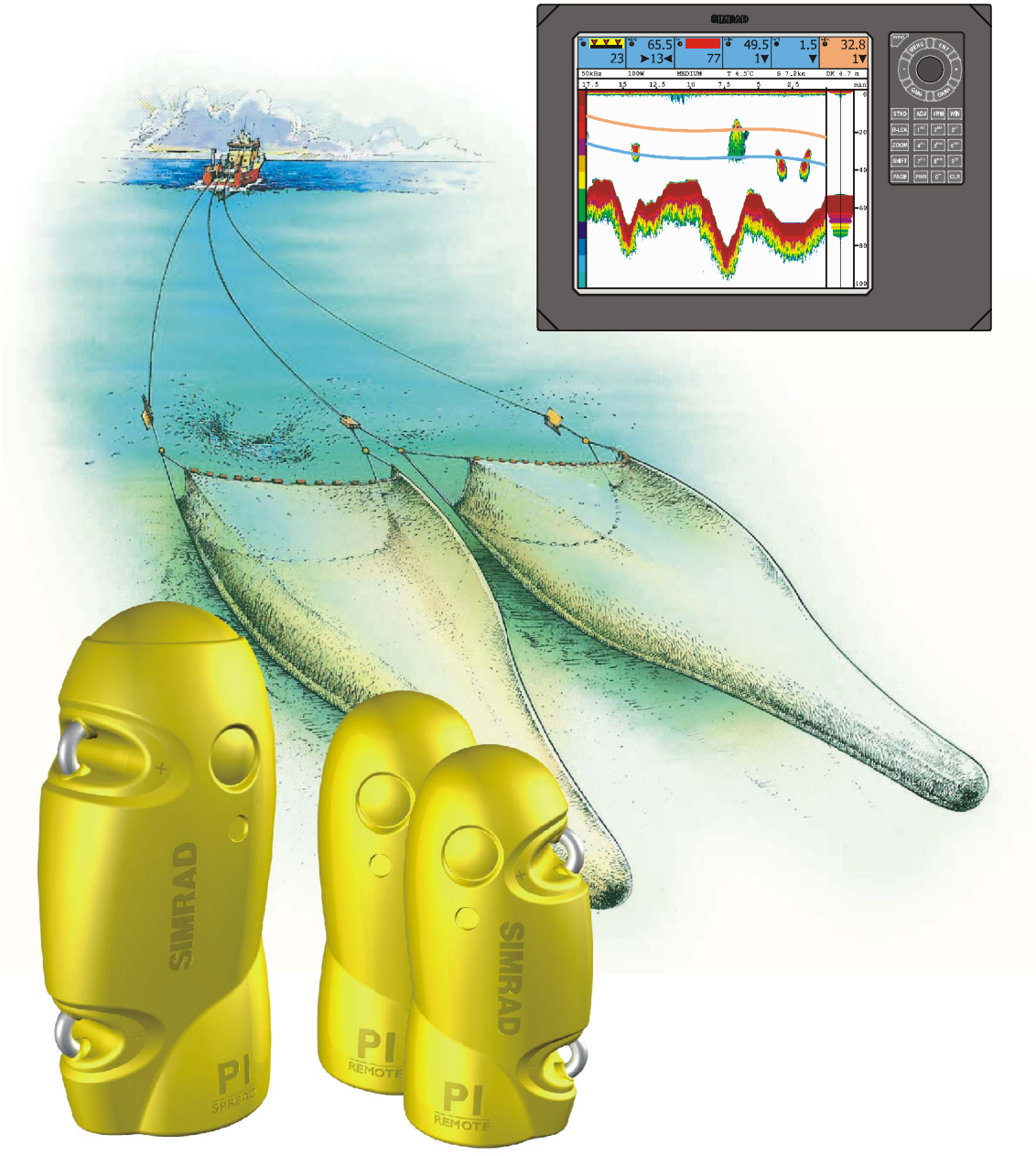
Installation manual

Simrad PI54
Catch monitoring system



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SIMRAD
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Simrad PI54
Catch monitoring system

Installation manual

NOTICE

Operation of the PI54 system assumes that the communication between the Operator Unit and the sensors is fully functional. Ensure that the communication channels defined on the Operator Unit matches those of the sensors.

About this document

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If you require maintenance on your Simrad equipment, contact your local dealer. You can also contact Simrad using the following e-mail address: fish-support@simrad.com

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1 Introduction

This section provides a general introduction to the PI54 installation. Refer to page 1.

2 Echo sounder transducer installation

This section provides general guidelines for the installation of the optional echo sounder transducer. Refer to page 18.

3 Purse hydrophone installation

This section provides general guidelines for the installation of the PI54 purse seine hydrophone. Refer to page 42.

4 Trawl hydrophone installation

This section provides general guidelines for the installation of the PI54 trawl hydrophone. Refer to page 79.

5 Portable hydrophone

This section provides general guidelines for the use of the PI54 portable hydrophone. Refer to page 120.

6 Operator Unit

This section explains how to install the PI54 Operator Unit cabinet. Refer to page 127.

7 Sensors

This section provides an introduction to PI54 sensors and the configuration of these. Refer to page 133.

8 Cable layout

This section details all cabling. Refer to page 142.

9 Interface setup

This section explains how to connect external equipment, such as navigation and positioning sensors. Refer to page 165.

10 Installing sensor adapters

This section explains how to install the PI Spread and PI Remote sensors on the trawl doors. Refer to page 179.

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1 INTRODUCTION

The purpose of this manual is to provide the information and basic drawings required for installation of the Simrad PI54 catch monitoring system. These instructions must be followed carefully to ensure optimal system performance. As a guide, installation procedures are presented in the order they are to be performed. After installation, this document must be stored on board the vessel for later reference when updating or servicing the equipment.

Note: *The installer is responsible for the equipment during the installation. The guarantee is only valid when the installation is made in accordance with this manual.*

Topics

→ *System diagram, page 2*

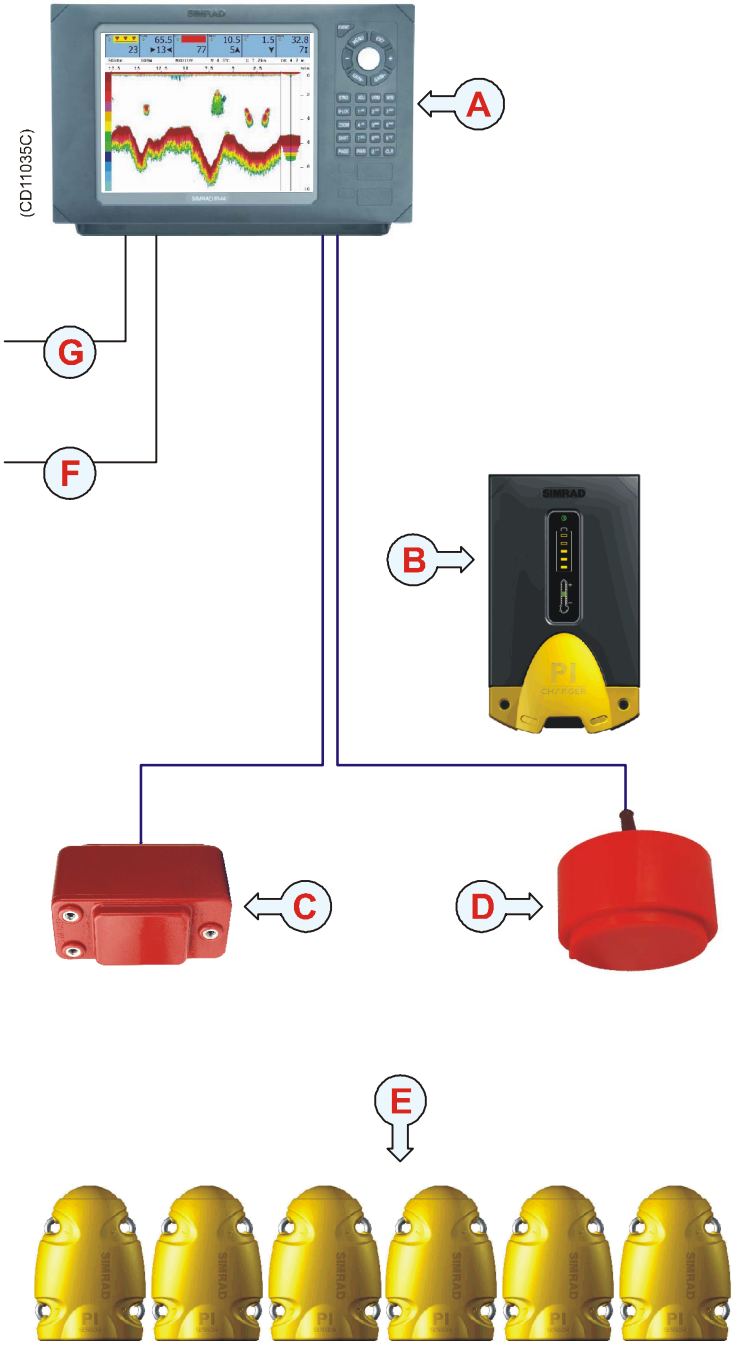
→ *Scope of supply, page 3*

→ *Supply conditions, page 5*

→ *General installation requirements, page 6*

→ *Equipment handling, page 7*

System diagram



(A) *= Operator Unit*

(B) *= PI charger*

(C) *= Hydrophone (provides communication with the sensors)*

(D) *= Optional echo sounder transducer. Several types are available.*

(E) *= Sensors mounted on the net. Maximum six sensors may be used simultanously, and several types are available.*

(F) *= Interfaces to external sensors (serial lines, NMEA format)*

(G) *= DC power input*

Scope of supply

Main units

The standard Simrad PI54 catch monitoring system is comprised of the following main units. All must be ordered separately.

Unit	Order number
PI54 Operator Unit	PI3-280025
Hydrophone, purse seine	HYD-202711
Hydrophone, trawl	HYD-205254
Hydrophone, portable	HYD-202713
Paravane kit for portable hydrophone	KIT-207284
+24 Vdc 5 A Power supply (230 vac)	290-076359
+13,2 Vdc 10 A Power supply (230 vac)	290-087521

Echo sounder transducers

The echo sounder transducers are optional. Note that only one of the echo sounder transducers is required. Only the transducers recommended by Simrad for use with the PI54 system are listed.

Transducer	Order number
38/200 Combi C	KSV-202192
38/200 Combi D	KSV-203004
38/200 Combi W	KSV-208845
50/200 Combi C	KSV-202193
50/200 Combi D	KSV-203005

Sensors

The Simrad PI54 catch monitoring system can operate with six sensors simultanously. Several sensor types are available.

Sensor	Order number
PI Bottom Contact sensor	PI3-207642
PI Catch sensor	PI3-207641
PI Depth sensor, 300 m	PI3-207637
PI Depth sensor, 600 m	PI3-207638
PI Depth sensor, 1000 m	PI3-207639
PI Height sensor	PI3-280002
PI Spread sensor	PI3-206869

Sensor	Order number
PI Twin Spread sensor	PI3-206896
PI Remote 1 sensor	PI3-206870
PI Remote 2 sensor	PI3-206871
PI Remote 3 sensor	PI3-206872
PI Remote 4 sensor	PI3-206885
PI Temperature sensor	PI3-207640

Sensor chargers

In order to charge the PI54 sensor batteries, the following charger is available.

Sensor	Order number
PI Sensor charger	LAD-207624

Supply conditions

The following supply conditions are applicable to standard Simrad PI54 deliveries and associated optional equipment.

Equipment responsibility

The shipyard performing the installation and/or dealer becomes fully responsible for the equipment upon receipt unless otherwise stated in the contract. The duration of responsibility includes:

- The period of time the equipment is stored locally before installation.
- During the entire installation process.
- While commissioning the equipment.
- The period of time between commissioning and the final acceptance of the equipment by the end user (normally the owner of the vessel which the equipment has been installed).

The Simrad PI54 system guarantee period (as specified in the contract) begins when the acceptance documents have been signed unless other arrangements have been made in the contract.

Receipt, unpacking and storage

Upon accepting shipment of the equipment, the shipyard and/or the dealer should ensure that the delivery is complete and inspect each shipping container for evidence of physical damage. If this inspection reveals any indication of crushing, dropping, immersion in water or any other form of damage, the recipient should request that a representative from the company used to transport the equipment be present during unpacking.

All equipment should be inspected for physical damage, i.e. broken controls and indicators, dents, scratches etc. during unpacking. If any damage to the equipment is discovered, the recipient should notify both the transportation company and Simrad so that Simrad can arrange for replacement or repair of the damaged equipment.

Once unpacked, the equipment must be stored in a controlled environment with an atmosphere free of corrosive agents, excessive humidity or temperature extremes. The equipment must be covered to protect it from dust and other forms of contamination when stored.

General installation requirements

Responsibility and approval

The Simrad PI54's hydrophone and echo sounder installation must be approved on a case-by-case basis with regard to the vessel's national registry and corresponding maritime authority. The shipowner and shipyard performing the installation are responsible for obtaining installation approval.

Environmental requirements

All equipment, unless otherwise specified, must be protected from temperature extremes and excessive humidity.

Compass deviation

Once the installation is complete, the vessel must be swung with the PI54 system in both the operative and inoperative modes. The shipowner and captain are responsible for updating the deviation table accordingly with regard to the vessel's national registry and corresponding maritime authority.

Noise sources

The vessel's hull, rudder(s) and propeller(s) should be thoroughly inspected in dry dock prior to installation. Roughness below the water-line deformities in the shell plating and protruding obstacles can create underwater noise. These sources of turbulence must be smoothed or removed as best as possible. It is especially important that the propeller(s) is not pitted or damaged.

Dry docking

Make sure that ample clearance under the hydrophone and echo sounder transducer is provided when dry docking the vessel. Avoid locating supporting blocks or structures in the vicinity of this equipment.

Note: *The location of the hydrophone and echo sounder transducer must be noted on the vessel's docking plan for future reference.*

Wiring

The cables from the wheelhouse to the hydrophone and echo sounder transducer must be supported and protected along its entire length using conduits and/or cable trays. Note that the cables must not be installed in the vicinity of high-power supplies and cables, antenna cables or other possible sources of interferences.

Equipment handling

The units may be supplied as spare parts, or as parts of a delivery.

Transportation

Unless otherwise stated in the accompanying documentation, electronic, electro-mechanical and mechanical units supplied by Simrad can be transported using all methods approved for delicate equipment; (by road, rail, air or sea). The units are to be transported in accordance with general or specific instructions for the appropriate unit(s), using pallets, transport cases, or carton boxes as appropriate.

Note: *Special local restrictions concerning air transportation may be applied to units containing certain types of batteries. The units should be checked and the regulations investigated by the packer/shipper before the unit is dispatched.*

All local transportation must be carried out according to the same specifications as for the initial delivery. In general, all units must be handled with care. The carton or case containing the equipment must be kept dry at all times, and must be sheltered from the weather. It must not be subjected to shocks, excessive vibration or other rough handling.

The carton or case will normally be marked with text or symbols indicating which way up it is to be placed. Follow any instructions given and ensure the case is always placed with its “top” uppermost.

The carton or case must not be used for any purpose for which it was not intended (step, table, etc.), and in the absence of other information, no other cartons or cases must be stacked on top of it.

Lifting

A heavy crate will normally be marked with its weight, and the weights of other cartons or crates will normally be entered on the packing list.

- Always check the weight of a crate before attempting to lift it.
- Always use lifting apparatus that is certified for the load.

Heavy units may be equipped with lifting lugs for transportation by crane within the workshop or installation area. Before a crane is used, check:

- The applicable weight certificate for the crane.
- The security of the lifting lugs.

Ensure that all available lifting lugs are used. Ensure the unit remains under control during the operation to avoid damage to the unit, equipment or personnel.

Heavy units may be transported using a fork-lift truck. Special attention must then be paid to the position of the unit's centre of gravity. The units must be properly secured to the truck.

Initial preservation

When a system, a unit or a spare part has been delivered to the customer, it may be subject to long-time storage prior to installation and use. During this storage period, certain specifications must be met.

The equipment must be preserved and stored in such a way that it does not constitute any danger to health, environment or personal injury.

Specific specifications are presented below.

→ *For further information about storage, refer to page 12.*

→ *For further information about re-packing, refer to page 15.*

→ *For further information about temperature protection, refer to page 17.*

Preserving the original packing crate

1 The equipment must be stored in its original transportation crate.

2 Ensure that the units are clearly separated in the shelves and that each unit is easily identifiable.

3 The crate must not be used for any purpose for which it was not intended (eg. work platform etc.).

4 The crates must not be placed on top of each other, unless specific markings permit this.

5 The crates must not be placed directly on a dirt-floor.

6 Do not open the crate for inspection unless special circumstances permit so.

- "Special circumstances" may be suspected damage to the crate and its content, or inspections by civil authorities.

- If any units are damaged, prepare an inspection report stating the condition of the unit and actions taken. Describe the damage and collect photographic evidence if possible. Re-preserve the equipment.
- If the units are not damaged, check the humidity absorbing material. If required, dry or replace the bags, then repack the unit(s) according to the packing instructions.

7 If the crate has been opened, make sure that is it closed and sealed after the inspection.

- Use the original packing material as far as possible.

→ *Refer to information on page 15.*

Ambient temperature and humidity during storage

1 The storage room/area must be dry, with a non-condensing atmosphere. It must be free from corrosive agents.

2 The storage area's mean temperature must not be lower than -30°C, and not warmer than +70° C.

- If other limitations apply, the crates will be marked accordingly.

Note: *Transducers must not be stored in temperatures below -20°C, or higher than +60°C.*

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3 The crate must not be exposed to moisture from fluid leakages.

4 The crate must not be exposed to direct sunlight or excessive warmth from heaters.

Shock and vibration during storage

1 The crate must not be subjected to excessive shock and vibration.

ESD precautions during storage

→ *Refer to the information on page 16.*

If the unit contains normal batteries, these may have been disconnected/isolated before the unit was packed. These must only be reconnected before the installation starts. Units containing batteries are marked.

Caution: *Units containing lithium or alkaline batteries must be handled separately and with care. Such units are marked accordingly. Do not attempt to recharge such batteries, open them or dispose of them by incineration. Refer to the applicable product data sheets.*

Inspection and unpacking

An inspection must be carried out immediately after the unit(s) have arrived at their destination.

- Check all wooden or cardboard boxes, plastic bags and pallets for physical damage. Look for signs of dropping, immersion in water or other mishandling.
- If damage is detected externally, you will have to open the packaging to check the contents.
  - Request a representative of the carrier to be present while the carton is opened, so any transportation damage can be identified.
- If any units are damaged, prepare an inspection report stating the condition of the unit and actions taken. Describe the damage and collect photographic evidence if possible. Send the inspection report to Simrad as soon as possible.
- If the units are not damaged, check the humidity absorbing material. If required, dry or replace the bags, then repack the unit(s) according to the packing instructions.

Inspection and unpacking: General procedure

Normal precautions for the handling, transportation and storage of fragile electronic equipment must be undertaken.

Note: *If the unit is not to be prepared for immediate use, you may consider storing it unopened in its original packing material. However, it may be useful to open the case to check its contents for damage and retrieve any accompanying documentation.*

- Check the carton before opening it to ensure it shows no signs of dropping, immersion in water or other mishandling.
  - If the carton shows signs of such damage, refer to the paragraph covering Inspection on receipt.

- Place the carton on a stable work bench or on the floor with the top of the carton uppermost.
- In the absence of other instructions, always open the top of the carton first. The contents will normally have been lowered into the carton from above, so this will usually be the easiest route to follow.
  - Care must be used when opening the carton to ensure the contents are not damaged.

Caution: *Do not use a knife to open cardboard cartons - the contents may lie close to the surface, and may be damaged by the blade.*

- If the carton has been closed using staples, remove the staples from the carton as you open it. This will reduce the possibilities of scratch injury to yourself and damage to the contents.
- If a wooden crate has been closed using screws, always remove them using a screw-driver. Do not attempt to prise the lid off with a crow-bar or similar.
- Once the carton is open, carefully remove all loose packing and insulation material. Check for manuals and other documents that may have been added to the carton during packing, and put these to one side. Check also for special tools, door keys etc.

Unpacking electronic and electro-mechanical units

Caution: *Beware of the dangers of Electro-Static Discharge (ESD) both to yourself and to the equipment, when handling electronic units and components. Refer to the precautions starting on page 16.*

Electronic and electro-mechanical units will normally be wrapped in a clear plastic bag. Lift the unit, in its bag, out of the carton and place it in a stable position on the floor/work bench.

Inspect the unit for damage before opening the plastic bag.

Note: *Cables must **never** be used as carrying handles or lifting points.*

Note: *Do not break the seal to open a circuit board package before the board is to be used. If the board package is returned to the manufacturers with the seal broken, the contents will be assumed to have been used and the customer will be billed accordingly.*

Assuming all is well, open the bag and remove the unit.

Open the unit and check inside. Remove any packing and desiccant material that may be inside.

Unpacking mechanical units

Mechanical units may be heavy. Using a suitably certified lifting apparatus, lift the unit out of the crate and place it in a stable position on the floor/work bench.

Inspect the unit for damage and remove any packing material that may be inside the unit.

Unpacking transducers

Transducers may be supplied mounted to a hull unit (if any), or packed separately. Crates are normally identified by the order number and the serial number.

The transducer face must be protected by a rigid, padded cover (e.g. a wooden box lined with foam rubber) all the time it is exposed to the risk of physical damage.

Note: *Once the units are unpacked, great care must be taken to ensure that transducers and cabling are not exposed to any mechanical stress.*

Re-packaging

If the unit is not to be installed immediately, re-pack it in its original packing material to prevent damage in the intervening period.

→ *Refer to the information on page 15.*

Pre-installation storage

The equipment should be stored in its original transportation crate until ready for installation. The crate must not be used for any purpose for which it was not intended (eg. work platform etc.).

Once unpacked, the equipment must be kept in a dry, non condensing atmosphere, free from corrosive agents and isolated from sources of vibration.

Note: *Do not break the seal to open a circuit board package before the board is to be used. If the board package is returned to the manufacturers with the seal broken, the contents will be assumed to have been used and the customer will be billed accordingly.*

The unit must be installed in its intended operating position as soon as possible after unpacking.

If the unit contains normal batteries, these may have been disconnected/isolated before the unit was packed. These must then be reconnected during the installation procedure. Units containing batteries are marked.

Caution: *Units containing lithium or alkaline batteries must be handled separately and with care. Such units are marked accordingly. Do not attempt to recharge such batteries, open them or dispose of them by incineration. Refer to the applicable product data sheets.*

After use storage

If a unit is removed from its operating location and placed into storage, it must be properly cleaned and prepared before packing.

Cleaning cabinets

If a cabinet has been exposed to salt atmosphere while it was in use, it must be thoroughly cleaned both internally and externally to prevent corrosion.

- Wipe the cabinet externally using a damp cloth and a little detergent. Do not use excessive amounts of water as the unit may not be water tight. On completion, dry the unit thoroughly.
- All surfaces must be inspected for signs of corrosion, eg. flaking/bubbling paint, stains etc. Damaged or suspect areas must be cleaned, prepared and preserved using the correct preservation mediums for the unit. The mediums to be used will usually be defined in the units' maintenance manual.

- Open the unit, and using a vacuum cleaner, remove all dust etc. from the unit. Great care must be taken to ensure the circuit boards and modules are not damaged in the process.

Mechanical units

If a mechanical unit may have been exposed to a salt atmosphere while it was in use, it must be thoroughly cleaned both internally and externally to prevent corrosion.

- If the construction materials and type of unit permits, wash the unit using a high-pressure hose and copious amounts of fresh water.

  Examples:

  - The lower parts of hull units (outside the hull)
  - Subsea units
- Ensure that all traces of mud and marine growth are removed. Use a wooden or plastic scraper to remove persistent growth, barnacles etc. On completion, dry the unit thoroughly.

Caution: *Do not use a high pressure hose in the vicinity of cables or transducers. Do not use sharp or metal tools on a transducer face.*

- If the materials or type of unit prevents the use of a high-pressure hose, wipe the unit using a cloth dampened with water containing a little detergent.

  Examples:

  - The upper parts of hull units (inside the hull)
  - Hydraulic systems
- Do not use excessive amounts of water as some components on the unit may not be water tight. Wipe off the detergent with a damp cloth, then dry the unit thoroughly.
- All surfaces must be inspected for signs of corrosion, eg. flaking/bubbling paint, stains etc. Damaged or suspect areas must be cleaned, prepared and preserved using the correct preservation mediums. The mediums to be used will normally be defined in the unit’s maintenance manual.

Cables

Wipe clean all exposed cables, and check for damage. If a cable shows signs of wear or ageing, contact Simrad for advice.

Internal batteries

If the unit contains batteries, these may discharge slowly during storage. If the unit is to be stored for an extended period, disconnect or remove all internal batteries.

A suitable piece of insulating material can be placed between the battery and the electrical contacts to prevent electrical discharge. The battery can then remain in the unit, reducing the risk of it being misplaced during the storage period.

Caution: *Units containing lithium or alkaline batteries must be handled separately and with care. Such units are marked accordingly. Do not attempt to recharge such batteries, open them or dispose of them by incineration. Refer to the applicable product data sheets.*

Dehumidifier

Place a suitably sized bag of desiccant material (silica gel or similar) into the unit to keep the electronic components as dry as possible.

Coatings

Spray the unit externally with a corrosion inhibitor (e.g. a light oil) before packing.

Re-packing

The unit should be stored and transported in its original packing material and/or crate. In the event that this material is not available, proceed as follows:

- Small units must be protected from damp by being placed within a plastic bag at least 0.15 mm thick. An appropriate quantity of desiccant material should be placed inside this bag, and the bag sealed. The sealed unit must then be placed in an appropriate carton or crate, and supported in the container by appropriate shock-absorbing insulation (polystyrene foam chips etc.).
- Large units must be placed in a suitable cardboard box or wooden crate. The unit must be protected against physical damage by means of shock-absorbing insulation mats. The box must be clearly marked with its contents, and must be stored in a dry and dust-free area.

ESD precautions

Electro-Static Discharge (ESD) is the transfer of an electrostatic charge between two bodies at different electrostatic potentials, caused either by direct contact or induction by an electrostatic field.

The passing of a charge through an electronic device can cause localised overheating, and it can also “puncture” insulating layers within the structure of the device. This may deposit a conductive residue of the vaporised metal on the device, and thus create a short circuit. This may result in a catastrophic failure, or degraded performance of the device.

Sensitive electronic equipment must be transported and stored in protective packing bags, boxes and cabinets. The equipment must NOT be transported or stored close to strong electrostatic, electro-magnetic or radioactive fields.

If it is necessary to open and touch the electronics inside the boxes/cabinets, then the following precautions MUST be taken:

- The working area must be covered by an approved conductive service mat that has a resistance of between 50kΩ and 2 MΩ, and is connected directly to a reliable earth point via its earthing cord.
- The service personnel involved must wear a wrist-band in direct contact with the skin, connected to the service mat.
- Printed circuit boards and other components should be placed on the conductive service mat during installation, maintenance etc.

Caution: *If, for any reason, it is necessary to move the circuit board or components from the conductive service mat, they must be placed in an approved anti-static transportation container (e.g. static shielding bag) before transportation.*

- During installation and servicing, all electrical equipment (soldering irons, test equipment etc.) must be earthed.

Temperature protection

If the unit must be protected against extremes of temperature, the carton/crate must be lined on all walls, base and lid with 5 cm thick polyurethane or polystyrene foam.

These units will be identified as delicate in the applicable documentation.

The package must then be clearly marked:

Note: *Must not be transported or stored in temperatures below -5 degrees Celsius.*

Other units can normally be stored in temperatures between -30° C and +70° C, refer to the system's technical specifications for details.

Transducers must not be stored in temperatures below -20°C and above +60°C.

2 TRANSDUCER INSTALLATION

Purpose

Due to the fact that several transducer types may be used with the PI54 system, you will need to read the installation manual for the chosen transducer. The information provided in this chapter will only provide general information. Refer to the installation manuals provided with the transducers for more specific information.

The PI54 can be used with maximum two transducers simultanously, one low frequency (38 or 50 kHz) and one high frequency (200 kHz). We recommend that any one of the following transducers are used:

- Simrad 38-200 Combi C (dual frequency)
- Simrad 38-200 Combi D (dual frequency)
- Simrad 38-200 Combi W (dual frequency, wide beam)

Other transducers may also be used. Budget transducers designed for leasure crafts are however not recommended for professional fishery applications.

Topics

→ *Transducer location, page 19*
→ *External mounting (Combi C and D), page 23*
→ *Blister mounting (Combi W), page 28*
→ *Cable glands, page 35*
→ *Cable in steel conduit, page 39*
→ *Handling and maintenance, page 40*
→ *Approved anti-fouling paints, page 41*

Related topics

→ *Purse seine hydrophone installation, page 42*
→ *Trawl hydrophone installation, page 79*
→ *Portable hydrophone, page 120*

Transducer location

General

A single answer to the question where to locate the transducer cannot be given. It depends very much on the vessel's construction. However, there are some important guide lines.

Go deep

The upper water layers of the sea contain a myriad of small air bubbles created by the breaking waves. In heavy seas the uppermost 5 to 10 metres may be air-filled, with the highest concentrations near the surface. Air bubbles absorb and reflect the sound energy, and may in worst cases block the sound transmission totally. Therefore, mount the transducer at a deep position on the hull.

Consider the situation when the vessel is unloaded, and when it is pitching in heavy seas. **The transducer must never be lifted free of the water surface.** Not only will the sound transmission be blocked, but the transducer may be damaged by slamming against the sea surface.

Another reason to go deep is cavitation in front of high power transducers. Cavitation is the formation of small bubbles in the water due to the resulting local pressure becoming negative during parts of the acoustic pressure cycles. The cavitation threshold increases with the hydrostatic pressure.

Vessel heave

Heave is the up and down movement of the vessel. It disturbs the echo traces in the echogram, so that a flat bottom is displayed as a wave. A transducer location in the middle of the vessel minimises the influence of vessel roll and pitch.

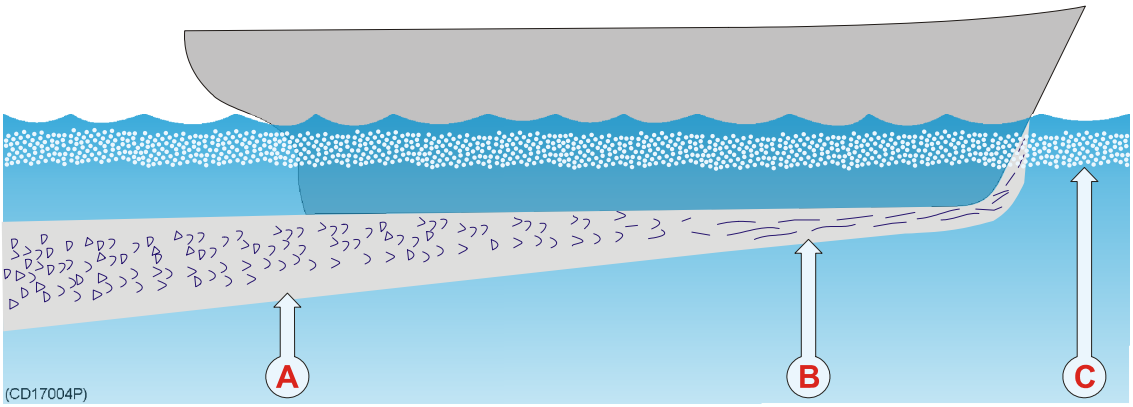
Noises from protruding objects on the hull

Objects protruding from the hull, such as zinc anodes, sonar transducers or even the vessel's keel, generate turbulence and flow noise. Also holes and pipe outlets are noise sources. They may act as resonant cavities amplifying the flow noise at certain frequencies. Do not place an echo sounder transducer in the vicinity of such objects, and especially not close behind them.

For the same reason, it is very important that the hull area around the transducer face is as smooth and level as possible. Even traces of sealing compound, sharp edges, protruding bolts or bolt holes without filling compound will create noise.

Boundary water layer

When the vessel forces its way through the sea, the friction between the hull and the water creates a boundary layer. The thickness of the boundary layer depends upon vessel speed and the roughness of the hull. Objects protruding from the hull, and dents in the hull, disturb the flow and increase the thickness of the boundary layer. The flow in this boundary layer may be laminar or turbulent. A laminar flow is a nicely ordered, parallel movement of the water. A turbulent flow has a disorderly pattern, full of eddies. The boundary layer increases in thickness when the flow goes from laminar to turbulent. The figure below illustrates the boundary layer of a vessel moving through the water.



Boundary water layers:

(A) = Turbulent flow

(B) = Laminar flow

(C) = Air bubbles in the water

Furthermore, air bubbles in the sea water are pressed down below the hull and mixed into the boundary layer. The boundary layer is thin underneath the forward part of the vessel, and increases in thickness as it moves towards aft. If the sides of the hull are steep, some of the air bubbles in the boundary layer may escape to the sea surface along the vessel sides. It is our experience that a wide and flat bottom, with a rising angle less than around 13 degrees, is prone to giving air problems for the transducer. In any case a transducer location in the forward part of the hull is preferred in order to minimise the influence of the boundary layer.

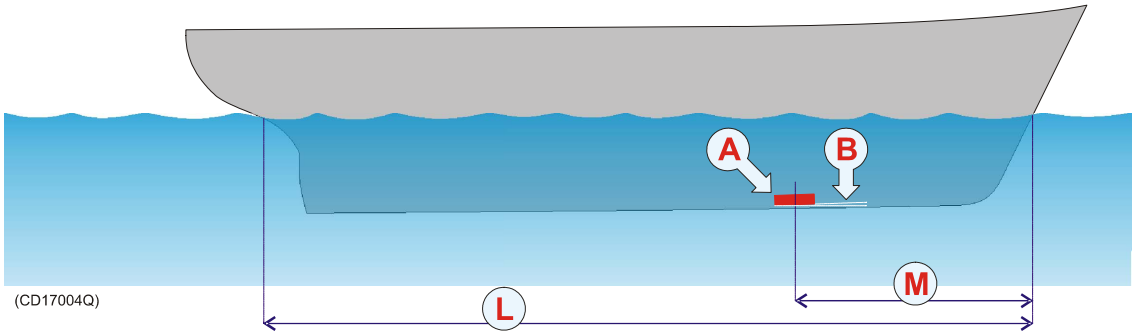
Propeller noise

The propulsion propeller is the dominant noise source on most fishing vessels, research vessels, merchant vessels and pleasure crafts. The noise is transmitted through the sea water. For this reason, the transducer should be placed far away from the propeller, which means on the fore part of the hull. Positions outside the direct line of sight from the propeller are favourable. On small vessels with short distances it is advised to mount the transducer on that side of the keel where the propeller blades move upwards, because the propeller cavitation is strongest on the other side. The cavitation starts most easily when the water flows in the same direction as the propeller blade, and that is to some degree the case at that side of the keel where the propeller blades move downwards.

Bow thruster propellers are extremely noisy. When in operation, the noise and cavitation bubbles make the echo sounder useless, almost no matter where the transducer is installed. And when not in operation, the tunnel creates turbulence, and if the vessel is pitching, the tunnel may be filled with air or aerated water in the upper position and release this in the lower position. Therefore, an echo sounder transducer should be placed well away from the bow thruster.

Summary and general recommendation

Some of the above guide lines are conflicting, and each case has to be treated individually in order to find the best compromise. Generally the propeller noise is the dominant factor, and a recommended transducer location is in the fore part of the hull, with maximum distance from the bow equal to one third of the total length of the hull at the water line.



General recommendation for transducer location:

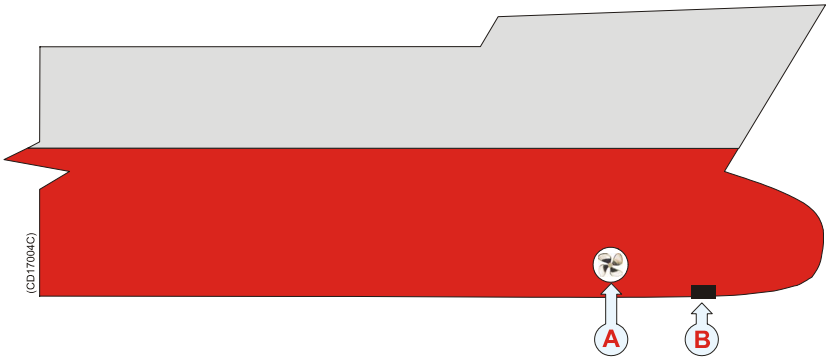
(A) = Transducer

(B) = Angle 1 - 2 degrees

(L) = Hull length at water line

(M) = Maximum 1/3 of the hull length at water line (L)

If the vessel hull has a bulbous bow, this may well be a good transducer location, but also here must be taken into consideration the flow pattern of the aerated water. Often the foremost part of the bulb is preferable.



Recommended location of the transducer on a bulbous hull:

(A) = Thruster

(B) = Transducer location

External mounting

This transducer has a streamlined housing, and it is designed for installation outside the hull.

This transducer is mainly used on smaller vessels. A location approximately **0.5 m** aside from the keel may be adequate for the passage of water between the keel and the transducer. The figures illustrate external mounting of transducers on steel hulls and on wood or polyester hulls respectively.

Inclination of the transducer face

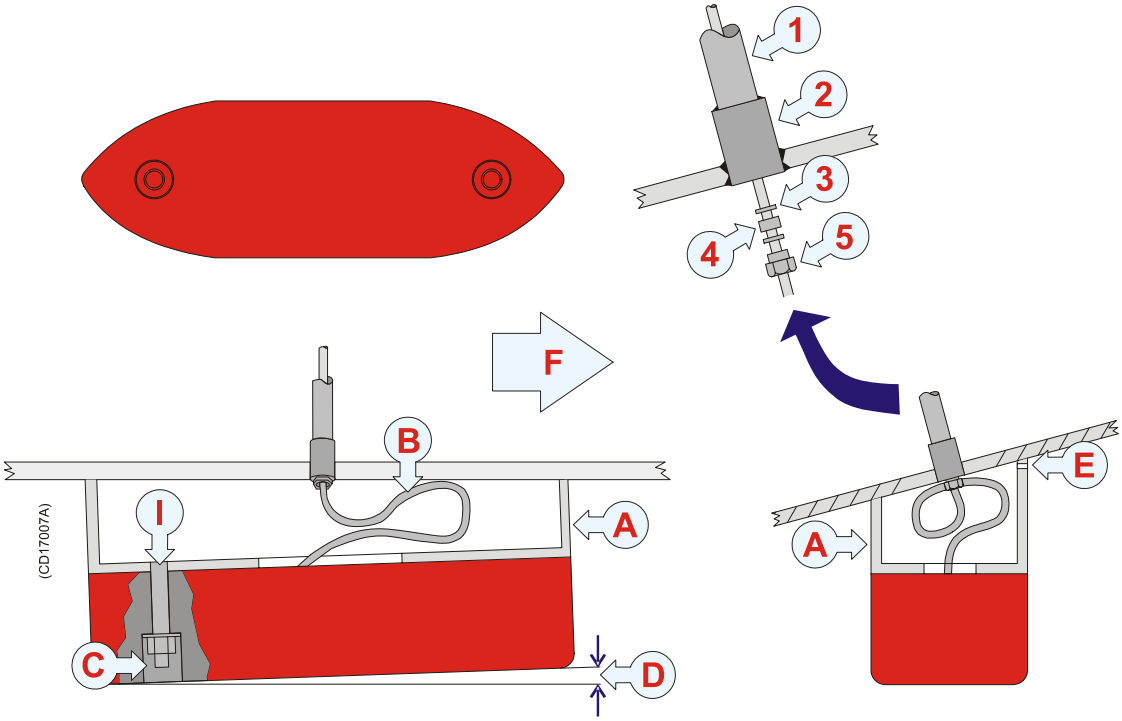
Incline the transducer face approximately 1-2 degrees (D), so that the flowing water meets it directly. This assures laminar water flow. Mounting screws must not be extruding from the transducer, and the space around the screws must be filled with a compound (C) and/or a locking ring.

Smooth surface

Ensure that the surface of the transducer face, the hull plating and putty around the transducer is as even and smooth as possible. Obstructions on these surfaces will create problems with turbulant flow.

Steel hull

A fairing (A), made by the shipyard, is placed between the transducer and the hull. It is required in order to adapt for the deadrise angle of the hull, and it will also house a cable service loop (B). The fairing can be made of wood or steel, and should have the same outline dimensions as the transducer. Remember to create an air outlet (E) on the fairing, and to fill the bolt holes with a filling compound to ensure a smooth transducer surface.



(A) = Fairing

(B) = Cable service loop

(C) = Filling compound

(D) = 1-2 degrees inclination

(E) = Air outlet

(F) = Forward

(I) = Threaded rod with nuts and washers, or bolt

(1) = Steel conduit

(2) = Stuffing tube

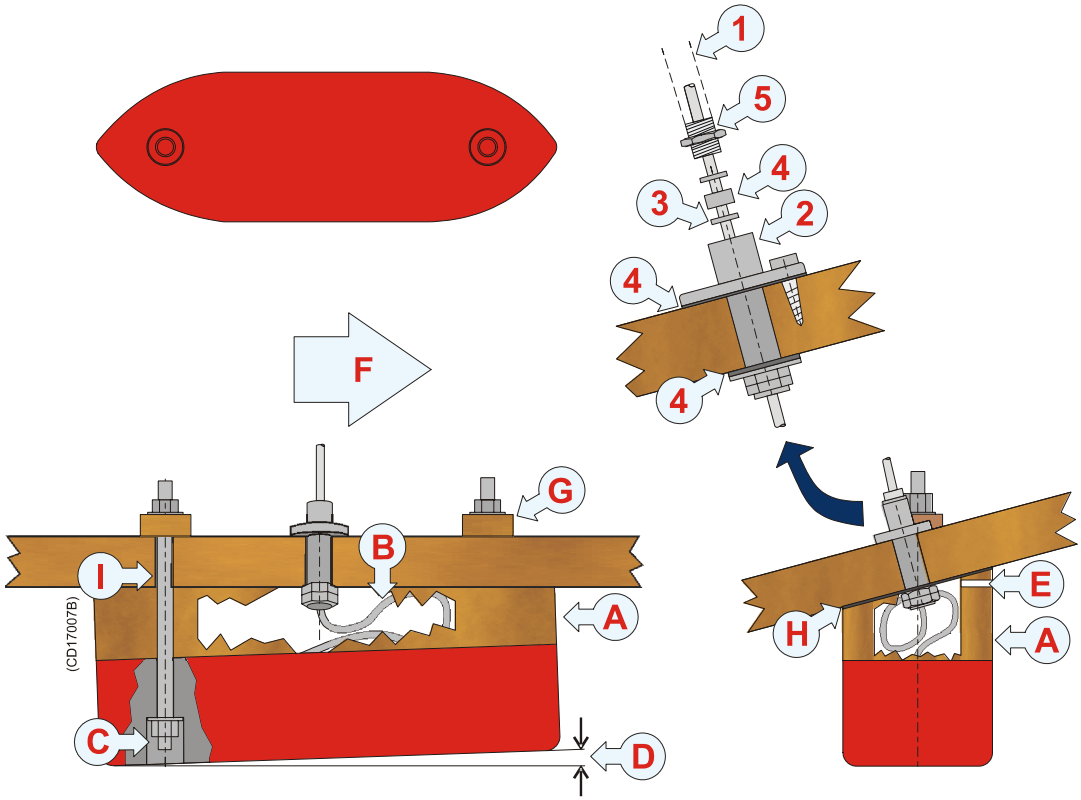
(3) = Washer

(4) = Rubber gasket

(5) = Packing nipple

Wood or polyester hull

A fairing (A), made by the shipyard, is placed between the transducer and the hull. It is required in order to adapt for the deadrise angle of the hull, and will also house a cable service loop (B). The fairing is made from wood, polyester or steel, and should have the same outline dimensions as the transducer. Use tarred felt (H) between th fairing and the hull. Remember to create an air outlet (E) on the fairing, and to fill the bolt holes with a filling compound to ensure a smooth transducer surface.



(A) = Fairing

(B) = Cable service loop

(C) = Filling compound

(D) = 1-2 degrees inclination

(E) = Air outlet

(F) = Forward

(G) = Shim (wood)

(H) = Tarred felt

(I) = Threaded rod with nuts and washers

(1) = Steel conduit

(2) = Stuffing tube

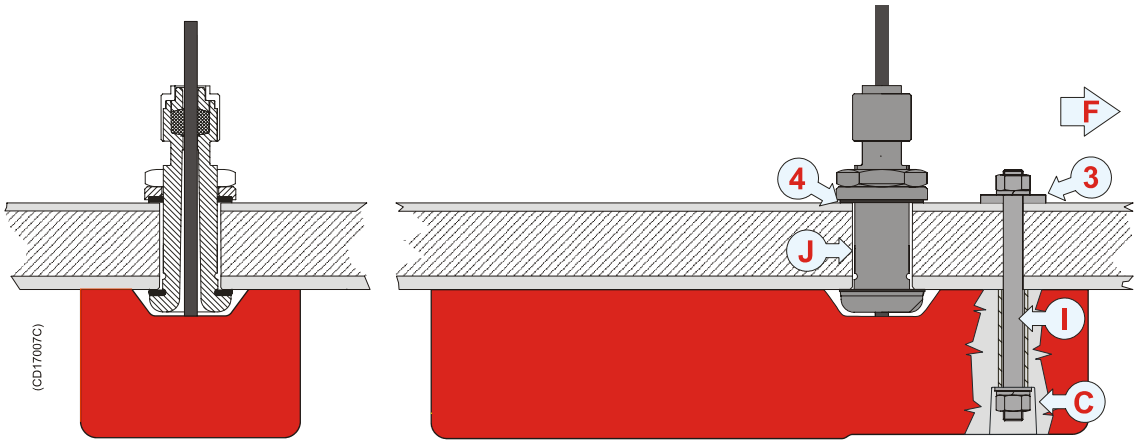
(3) = Washer

(4) = Rubber gasket

(5) = Packing nipple

Flat hull

If the vessel's hull is flat you do not need a fairing. The transducer is then be bolted directly to the hull using two bronze or stainless steel bolts (I) and a cable bushing. Note that the cable bushing must be mounted with proper gaskets (4) under and over the hull, as well as sealing compound (J) around the its body. Also, fill the bolt holes with a filling compound to ensure a smooth transducer surface.



(C) = Filling compound

(3) = Washer

(F) = Forward

(4) = Rubber gaskets

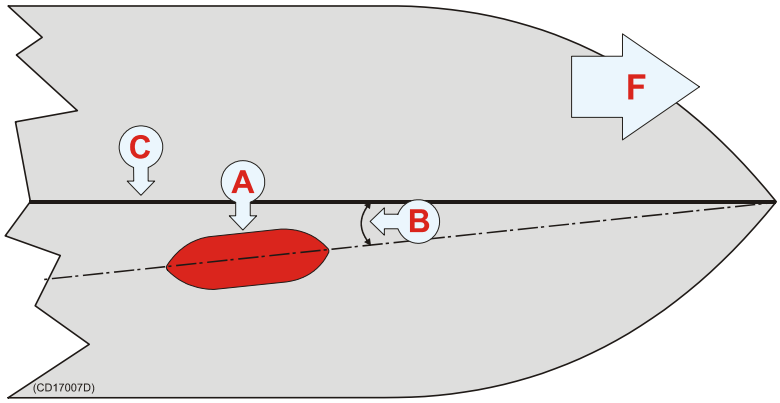
(I) = Threaded rod with nuts and washers

(J) = Sealing compound

Longitudinal angle

On deplacement hulls, the transducer (A) must be mounted in an angle of 5 to 8 degrees (B) in relation to the keel (C).

With a planing hull, this angle must be 0 degrees.



(A) = Transducer

(B) = 5 to 8° on deplacement hulls, 0° on planing hulls

(C) = Keel

(F) = Forward

Transducer blister

With a transducer with circular housing, one recommended installation method is by using a blister.

The transducer blister must be designed and manufactured by the installation shipyard to fit the vessel’s sixe and hull shape.

Mounting and clamping rings

Circular transducers may be provided with mounting and clamping rings, or with drawings to allow for local production of these. The mounting ring is welded to the hole in the transducer blister, while the clamping ring fits around the edge of the transducer body. Bolts through the clamping ring into the mounting ring will then secure the transducer between them. Note that several transducers use direction guides to allow correct mounting.

Inclination of the transducer face

Incline the transducer face approximately 1-2 degrees, so that the flowing water meets it directly. This assures laminar water flow.

Smooth surface

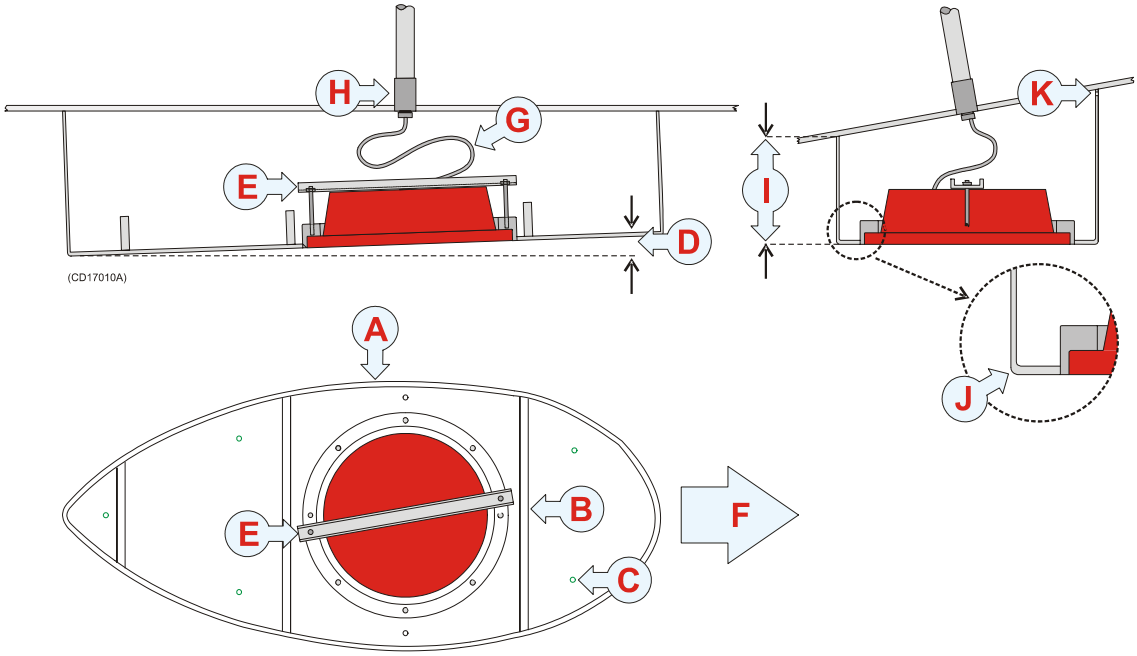
Mounting screws or bolts must not be extruding from the transducer blister. Ensure that the surface of the transducer face, the blister, the hull plating and putty around the transducer is as even and smooth as possible. Obstructions on these surfaces will create problems with turbulant flow.

Horizontal support bar

Large diameter transducers must be fitted with a horizontal support bar. This bar can be secured to the mounting ring using threaded rods.

Example: Large transducer

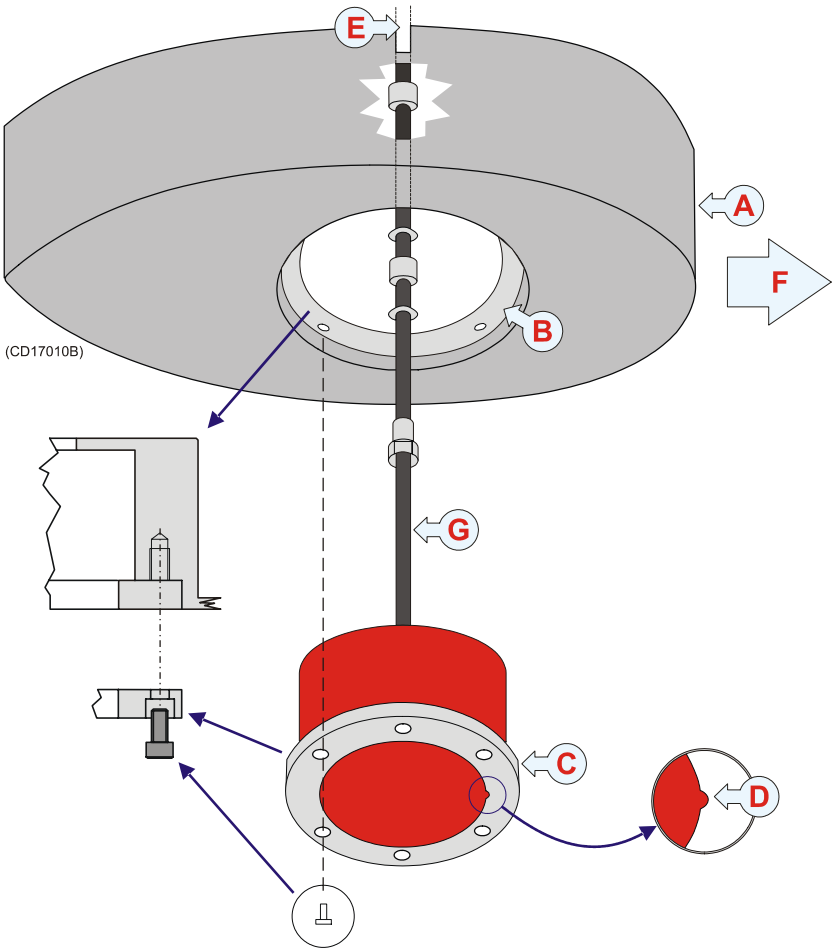
The illustration below shows a typical transducer blister designed for a large transducer. Note that due to the physical size of the transducer, a U-shaped support bar (E) is used to support the transducer.



(A) = Streamlined blister
(B) = Stiffening rib
(C) = Drainage holes
(D) = 1-2 degrees angle
(E) = U-shaped support bar
(F) = Forward
(G) = Cable service loop
(H) = Stuffing tube
(I) = Minimum 400 mm
(J) = Rounded corners
(K) = Air outlet

Example: Small transducer

The illustration below shows a typical transducer blister designed for a small transducer. The same blister design principles as for a large transducer apply.



(A) = Streamlined blister

(B) = Mounting ring

(C) = Clamping ring

(D) = Guide

(E) = Air outlet

(F) = Forward

(G) = Transducer cable

Note that the transducer cable must be provided with a cable loop inside the blister. Observe the vertical forward edge of the blister. This will guide the water to each side of the blister.

Common guidelines

The best performance is obtained with a blister height of 40 cm or more. A streamlined shape and rounded edges reduce the flow noise. A vertical leading edge or front will guide the aerated water to the sides of the blister. The orientation of the blister should follow the water flow.

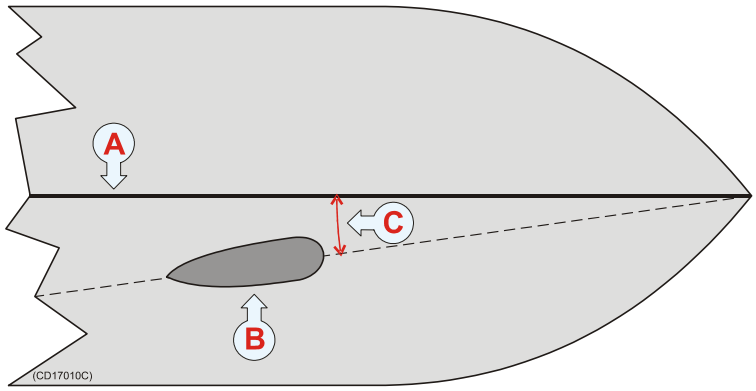
The interior of the blister must be filled with sea water. Use drainage holes in the bottom and an air outlet on the top. The water pressure behind the transducer will then compensate for the outside pressure during vessel movements in rough sea.

Large diameter transducers must be fitted with a horizontal U-shaped support bar. This bar can then be secured to the mounting ring using threaded rods.

The transducer cable penetrates the hull in a stuffing tube. Leave an adequate loop of the cable behind the transducer for easy mounting or removal of the transducer.

Toe-in

On a conventional hull shape, without a bulb, the front of the blister should have a few degrees toe-in towards the bow.



(A) = Keel

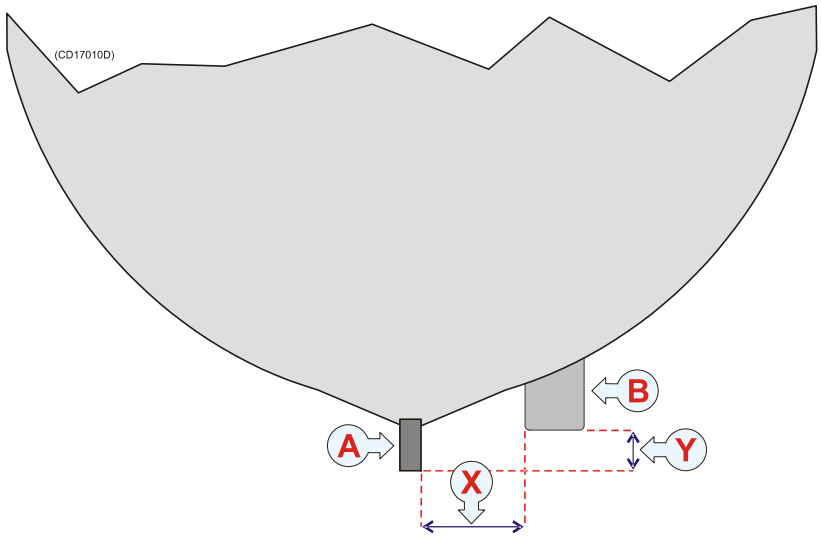
(B) = Blister

(C) = Toe-in angle 5 to 8 degrees

Physical location

The blister is placed on one of the sides of the hull, and the distance from the keel is a trade off between a close distance giving a turbulent flow of water in a narrow passage, and a large distance bringing the transducer higher up and also more affected by vessel roll. Normally a distance of approximately 1 m is a good compromise.

Observe the horizontal and vertical distances (X and Y) between the keel and the transducer blister. On a medium sized vessel, the horizontal distance (X) should be approximately 1 meter. The vertical distance (Y) must in general be as small as possible. This is important to prevent the keel from shadowing the transducer beam in shallow waters.



(A) = Keel

(B) = Transducer blister

(X) = Horizontal distance between keel and blister

(Y) = Vertical distance between the blister surface and the keel

Box keel

Vessels with a box keel may use this for transducer installation.

The box keel is already the deepest part of the vessel. If the box keel is too narrow to accommodate the transducer, it can be widened, either symmetrically or to one side only. In the last case the installation could also be described as a blister merged into the keel.

Mounting and clamping rings

Circular transducers may be provided with mounting and clamping rings, or with drawings to allow for local production of these. The mounting ring is welded to the hole in the box keel, while the clamping ring fits around the edge of the transducer body. Bolts through the clamping ring into the mounting ring will then secure the transducer between them. Note that several transducers use direction guides to allow correct mounting.

Inclination of the transducer face

If possible, incline the transducer face approximately 1-2 degrees, so that the flowing water meets it directly. This assures laminar water flow.

Smooth surface

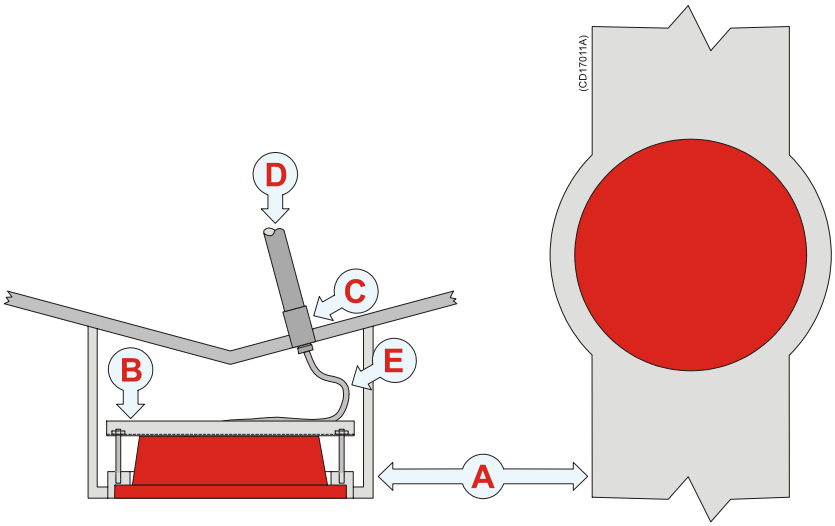
Mounting screws or bolts must not be extruding from the box keel. Ensure that the surface of the transducer face, the box, the hull plating and putty around the transducer is as even and smooth as possible. Obstructions on these surfaces will create problems with turbulant flow.

Horizontal support bar

Large diameter transducers must be fitted with a horizontal support bar. This bar can be secured to the mounting ring using threaded rods.

Example

The figure below illustrates a symmetrical box keel installation.



(A) = Box keel

(B) = U-shaped support bar

(C) = Stuffing tube

(D) = Cable in steel conduit

(E) = Cable service loop

Cable glands

The transducer cable must pass through the hull using approved cable glands for the type of vessel in question.

A **steel** cable gland is normally used on professional vessels with steel hulls. A **bronze** cable gland can be delivered as an option for vessels with wood or fibreglass construction. Vessel not to be classified can as an option use a cable gland made of **plastic**.

Note: *Simrad strongly recommends that a length of conduit is fitted around transducer cable glands made of steel or bronze and extended over the water-line inside the vessel. This precaution reduces the danger of flooding in the event of gland failure and transducers installed in this manner are also easier to replace.*

Some vessels may experience difficulties finding suitable areas of the hull for mounting transducer cable glands due to existing water tanks, concrete ballast or other obstacles. A possible solution in such cases is to run the transducer cables in a steel conduit aft along the hull until a suitable cable gland location is available. The respective cable gland can then be installed as described in the following instructions.

Note: *Simrad takes no responsibility for the correct installation of cable glands, associated hull modifications and/or structural support of transducer cable penetration. These activities are subject to individual approval by the respective classification society for the vessel in question.*

Order numbers

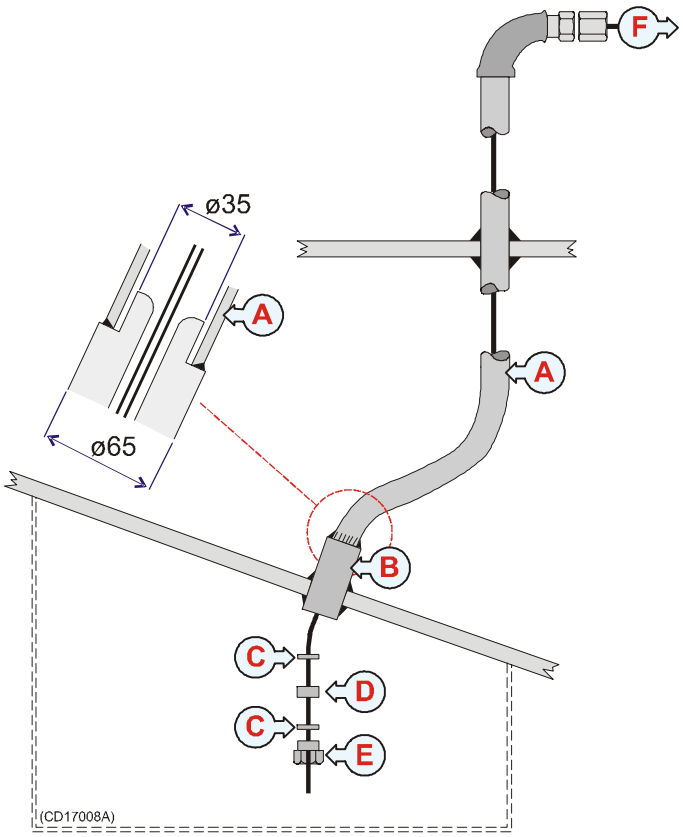
Steel hull cable gland kit: 599-202216

Wood/GRP hull cable gland kit: 119-038200

Small vessel cable gland kit: 599-202182

Cable gland installation for steel hulls

This cable gland kit is designed for steel vessels. It must be welded to the hull plates.



(A) = Steel conduit

(B) = Stuffing tube, DNV approved carbon steel st52.3

(C) = Washers, 24 x 8 x 2 mm

(D) = Rubber gasket

(E) = Packing nipple. Make sure that you do not damage the transducer cable by tightening the packing nipple too hard!

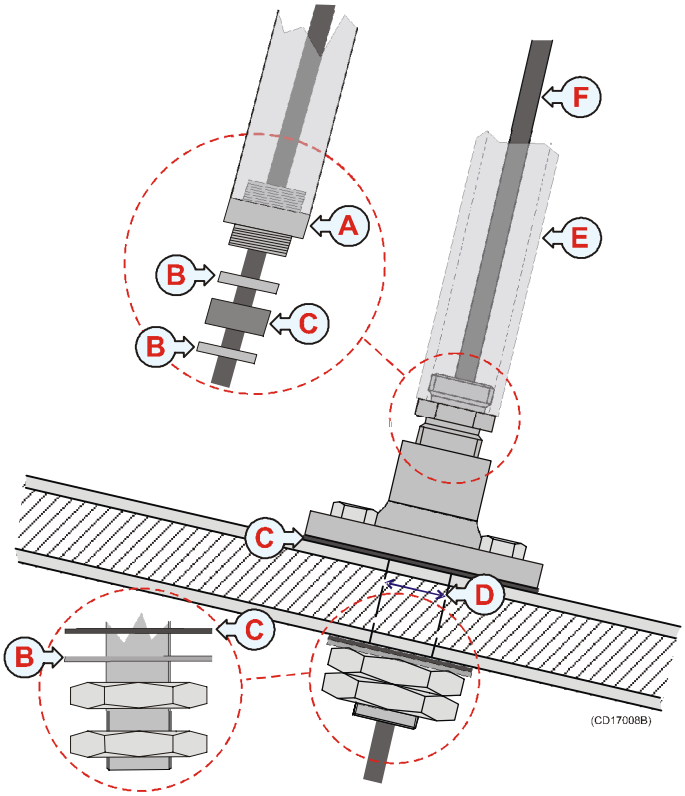
(F) = Cable to the echo sounder (or a junction box)

The gland gland kit includes all of the necessary parts needed to install the unit excluding screws.

Simrad recommends that a one inch steel conduit (that the transducer cable will be run through) with an inside threaded diameter of three-quarter inches is welded to the gland's stuffing tube. The conduit must extend to above the vessel's water line.

Gland installation for wood or GRP hulled vessels

A bronze cable gland kit is available for wood and GRP vessels.



(A) = Packing nipple. Make sure that you do not damage the transducer cable by tightening the packing nipple too hard!

(B) = Washers

(C) = Rubber gaskets

(D) = Hole diameter 28 mm

(E) = Steel conduit

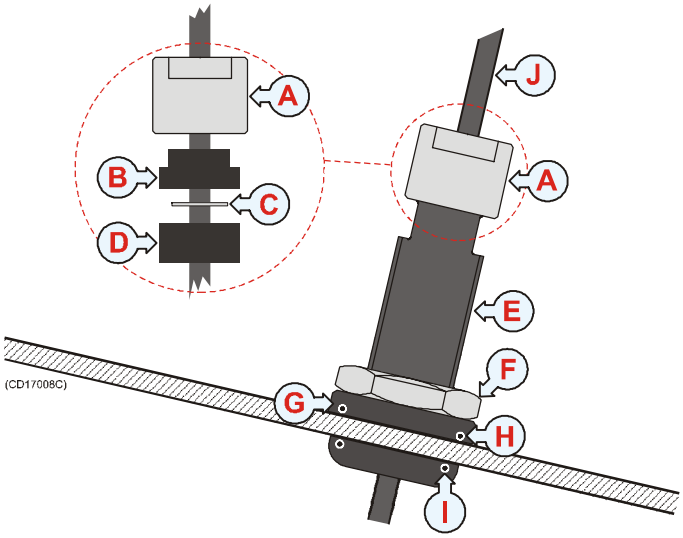
(F) = Cable to the echo sounder (or a junction box)

The gland gland kit includes all of the necessary parts needed to install the unit excluding screws.

Simrad recommends that a one inch steel conduit (that the transducer cable will be run through) with an inside threaded diameter of three-quarter inches is attached to the gland's packing nipple. This connection must be watertight, and the conduit must extend to above the vessel's water line.

Cable gland installation for smaller vessels

This cable glands made of plastic is designed for those smaller vessels that do not need to be classified.



(A) = Packing nut (bronze). Ensure that you do not to damage the transducer cable by tightening the packing nut too hard!

(B) = Rubber gasket

(C) = Plastic disk

(D) = Rubber gasket

(E) = Stuffing tube

(F) = Backing nut (bronze)

(G) = Backing washer (plastic)

(H) = O-ring 42.5 x 3.0 N

(I) = O-ring 39.5 x 3.0 N

(J) = Cable to the echo sounder (or a junction box)

Stuffing tube hole diameter: 36 mm ±1.5 mm.

Apply ample amount of sealant between the backing washer (H) and the hull plate.

The cable gland kit contains all the listed parts, except the sealant.

Note: *The two O-rings must be clean, in good condition and free of cuts or other defects which could affect their water-tight integrity.*

Splicing

If you need to cut the transducer cable, you must splice it correctly.

Note: *DO NOT solder the wires together with only electrical tape for insulation, as this will result in electrical noise and reduced operational performance.*

To splice the cable, use a metal junction box. The chassis of the junction box must be grounded, but the cable shielding must NOT be connected to the junction box ground.

Cable in steel conduit

It is strongly recommended to lay a steel conduit from the transducer's cable gland to the echo sounder transceiver, and to pull the transducer cable through this conduit. There are two reasons for this.

- First, it will make it easier at a later stage to replace the transducer.
- Second, noise and interference from other electrical equipment is greatly reduced.

With a steel conduit the installation will satisfy the EU regulations for EMC interference. Without a steel conduit, there is a risk of reduced echo sounder performance.

The steel conduit must be unbroken and watertight from the transducer to above the water line. From there, the cable can be pulled further, or a junction box can be installed to facilitate further connections. Note that the steel conduit must act as a continuous electrical screen all the way. To ensure proper shieklding, the conduit must be electrically connected to the echo sounder transceiver chassis.

Steel conduit dimensions:

- minimum 35 mm inner diameter
- minimum 6 mm wall thickness (4.5 mm if galvanised).

If two or more transducers are installed close to each other it is possible to pull their cables in the same steel conduit, provided the conduit diameter is increased accordingly. However, for easy replacement it is recommended that each transducer has its own steel conduit.

Handling and maintenance

Do not lift the transducer by the cable.

Some transducers are delivered with a cover plate on the face for protection during transport. Let this plate stay on as long as possible, but do not forget to remove it before the vessel goes into the sea.

An anti-fouling paint may be applied to the transducer face. Because some paint types may be aggressive to the polyurethane in the transducer face, please consult Simrad's list of approved paints on the next page.

Note: *Arctic tanks have acoustic windows made of polycarbonate. These must neither be painted nor cleaned with chemicals.*

During dry docking of the vessel, the transducer face may be cleaned for shells and other marine fouling. Be careful not to make cuts in the transducer face. Use a piece of wood or a very fine grade emery paper.

Approved anti-fouling paints

This is Simrad's list of approved antifouling paints on polyurethane transducer housing.

From **Jotun Paints, Sandefjord Norway**:

- Antifouling Seamate HB 33
- Antifouling Seamate HB 66
- Antifouling Seamate HB 99
- Racing
- Non-stop

From **International Paints**:

- Intersleek tie coat + 425 FCS
  - BXA386/BXA390/BXA391 Grey
  - HKA563/HKA570/HKA571 Yellow

Mix BXA386, BXA390 and BXA391 first, then apply. When dry, mix HKA563, HKA570 and HKA571, apply.

From **Hempel IFA Coatings AS**:

- Hempel A/F Classic 76550

From **Jotun-Henry Clark Ltd**:

- Anti-fouling Seaguardian

From **International Marine Coatings**:

- Intersmooth 360 Ecoloflex SPC
- Micron Ekstra

Note: *Refer to the manufacturer's documentation and data sheets for a complete procedure.*

3 PURSE SEINE HYDROPHONE

Purpose

The purpose of this chapter is to provide general guidelines for the installation of the PI54 hydrophone for **purse seining**.

Note: *If your vessel shall be fitted for trawl operations, DO NOT install the hydrophone(s) as explained in this chapter!*

Order numbers

Purse hydrophone, complete: HYD-202711

Purse hydrophone, without cable gland: HYD-205075

Topics

→ *Precautions, page 43*
→ *Considerations, page 44*
→ *Pre-installation checklist, page 48*
→ *Location, page 50*
→ *Coverage area, orientation and tilt, page 51*
→ *Mounting arrangement, page 54*
→ *Dual hydrophones, page 57*
→ *Hydrophone protection, page 59*
→ *Hydrophone cable, page 62*
→ *Installation drawings, page 67*

Installation precautions

Caution: *The following precautions must be observed. Failure to do so can result in damage to the hydrophone which may render the PI54 catch monitoring system inoperative.*

1 Observe the maximum allowable torque warning of 5 Nm when tightening the hydrophone studs.

2 Use only M8x35 socket countersunk head screws for mounting the hydrophone.

3 Secure threaded hydrophone hardware with Loctite™ 270 or the equivalent.

4 Do not paint the hydrophone.

5 Do not sand-blast, power or steam wash the hydrophone.

6 Do not scrape the hydrophone with metal or other hard objects that may damage the polyurethane sheathing.

7 Do not strike the hydrophone.

8 Do not expose the hydrophone to harsh chemicals.

9 Do not perform hot work in the vicinity of the hydrophone.

10 Do not lift the hydrophone by its cable.

Considerations

Correct installation of the PI54 hydrophone is vital to the system's performance. Several variables must be taken into consideration, the most important of which is the vessel's construction. This guide is for use in selecting the best location for the hydrophone and includes a brief description of areas to be avoided.

Note: *Simrad strongly suggests that this information is read thoroughly, and that the instructions are understood and followed. Proper hydrophone placement is difficult to achieve, but essential for correct system operation.*

Depth

Water just below the sea surface contains a myriad of small air bubbles created by the turbulence of breaking waves. The first five to ten metres may be heavily saturated in moderate seas with the greatest concentration and largest bubbles closest the surface. Air bubbles disrupt sound waves in water. The degree to which they absorb and reflect such energy vary, but in some cases they can block hydrophone reception. It is therefore recommended to mount the unit as deep as possible.

Pounding danger

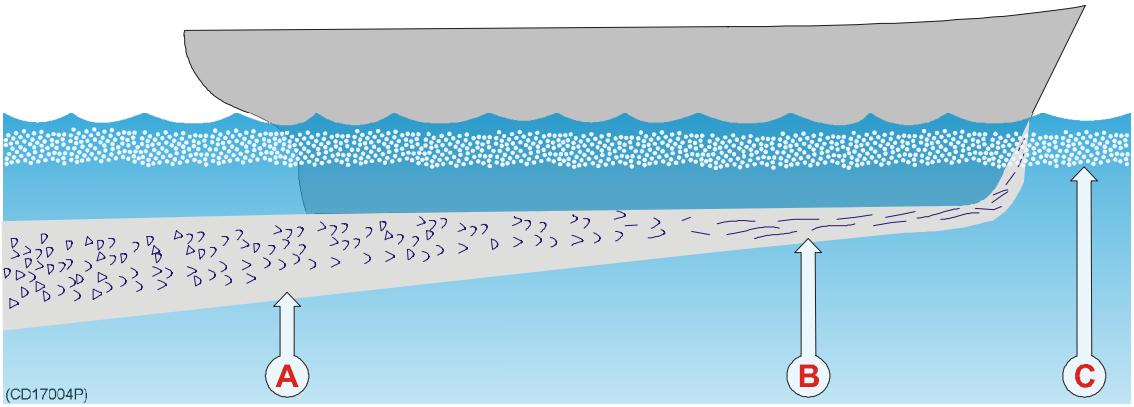
When a vessel is in ballast and pitching in heavy seas, it is important that the hydrophone is not lifted out of the water. Should a vessel pound so heavily that the hydrophone be exposed, sound reception will be interrupted and the unit may be damaged on impact.

The boundary layer

The flow of water in the immediate vicinity of the hull of a moving vessel is known as a boundary layer. This flow is responsible for underwater noise that can disturb hydrophone reception and its thickness is contingent on a vessel's:

- Hull form
- Size and number of underwater protrusions
- Velocity
- Hull roughness

The boundary layer is thin (laminar flow) near the vessel's bow and becomes thicker (turbulent flow) as it moves aft. Laminar flow is smooth with streamlines approximately parallel to the hull and contributes relatively little to noise created by flow. Conversely, turbulent flow is more disorderly and in turn contributes to a greater extent.



Boundary water layers:

(A) = Turbulent flow

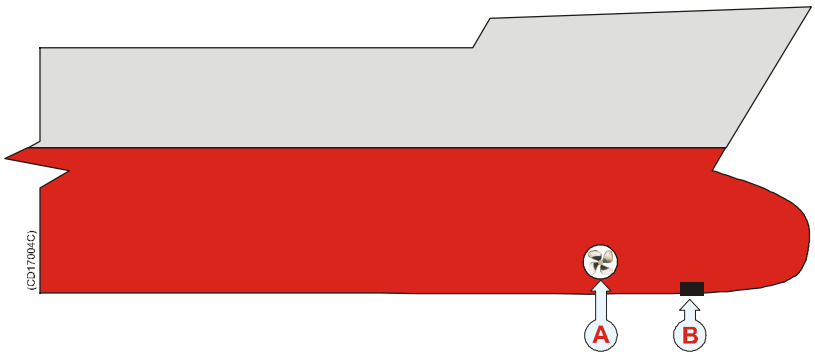
(B) = Laminar flow

(C) = Air bubbles in the water

Air bubbles may also be introduced into the boundary layer. If the vessel's hull has little flare and is relatively narrow, bubbles may escape to the sea surface without incident. On the other hand a wide, flat hull with minimal deadrise is prone to trapping air bubbles no matter how little flare it has. Regardless of a vessel's hull form, hydrophones are generally recommended to be installed on the forward part of the hull to minimising the influence of both turbulence and air bubbles.

Bulbous bow

The bulbous bow may be an acceptable hydrophone location. Should this position be chosen, the foremost part of the bulb is often best, but also the most susceptible to pounding.



Recommended location of the hydrophone on a bulbous hull:

(A) = Thruster

(B) = Hydrophone location

Propeller noise

A vessel's main propeller is the dominant source of underwater acoustic noise. When ever possible, hydrophone(s) should be located as far a way as possible from the main propeller and never closer than ten meters. Hydrophone(s) should not be mounted in the direct acoustic path (line-of-sight) of the main propeller unless absolutely necessary.

The primary cause of propeller noise is cavitation (small bubbles generated by the partial vacuum created by the blades as they pass through the water). The resulting underwater acoustic noise from cavitation is normally weakest on the side of the vessel were the propeller blades rotate toward the surface and most pronounced on the side were they rotate toward the bottom. Most vessels have clock-wise rotating propellers resulting in their port sides being less effected by cavitation induced noise than their starboard.

To minimise the negative effect of cavitation noise on hydrophone performance, installation is generally recommended as follows:

- **Single hydrophone -** if only one hydrophone is to be installed on a vessel with a clock-wise rotating propeller, it should be located on the port side of the hull.
- **Dual hydrophones -** if two hydrophones are to be installed, they should be placed on either side of the vessel's keel. When in doubt about the best fore-and-aft location for hydrophones, they can be placed at different distances from the bow (for example the port hydrophone can be a little further aft than the starboard, approximately three to five meters for a thirty-five meter vessel). When trawling in both deep and shallow water the hydrophones should also be tilted differently with respect to each other. The hydrophone that is closest to the propeller should have the greatest tilt and be located on the port side of the hull for a vessels with clock-wise rotating propellers.

Bow / sternthruster noise

Bow and sternthruster operation may severely effect hydrophone reception. Hydrophone installation closer than four meters to either is strongly discouraged.

When not in operation, bow/sternthruster tunnels create turbulence and hence underwater noise when a vessel is under way. Also, as a vessel pitches in heavy weather, thruster tunnels may fill with air or aerated water which can disturb hydrophone reception when released. Hydrophone installation should take into regard the noise and down stream disturbances found around and aft of thrusters.

Note: *Hydrophone installation must take into regard the noise and down stream disturbances found around and aft of thrusters.*

Noise from protruding objects and other sources

The primary sources of underwater disturbance (other than a vessel's main propeller and bow/sternthruster) that affect hydrophone reception are:

- Main or bilge keels
- Zinc anodes
- Cooling elements protruding from the hull
- Equipment such as sonar hydrophones and pitot tubes
- Sea chests
- Overboard discharges
- Dents in the hull

All appendages to the hull, indentations and pipe outlets are potential sources of underwater noise. They may act as resonant cavities amplifying noise at certain frequencies, create cavitation or turbulence. Hydrophones should not be located in the vicinity of such objects and especially not immediately aft of them.

Minimum distance to sonar and echo sounder transducers

To avoid interference, PI54 hydrophone(s) must be installed as far away as possible from other sources of underwater acoustical energy such as active sonars and echo sounder transducers. Hydrophones should be placed at least two meters from such equipment when ever possible and distances of less than one meter avoided. Hydrophones installed in close proximity to underwater acoustical sources should be located as far aft as possible from them, and most importantly, not be subjected to direct (frontal) transmission from such equipment.

Drop keel

In the event the vessel is equipped with a drop keel, the hydrophones should be mounted aft of it. The choice between installing a one, or two hydrophone system should be based on the same horizontal and vertical coverage requirements for vessels operating under similar conditions with fixed keels.

Pre-installation check-list

Choosing the optimal locations for hydrophones is not always easy, but decisions made at this phase of the installation process are critical to future system performance. Determining the best configuration for a given vessel often involves a compromise between contradicting requirements.

To aid in this evaluation process Simrad recommends that this installation manual be read thoroughly and the following check list completed before deciding on a final installation strategy for the PI54 system.

1 Hydrophones do not have a direct line-of-sight to the main propeller and are placed where the vessel's hull protects them from underwater acoustic noise as well as possible.

2 Hydrophones must always have an unobstructed line-of-sight to the sensors attached to the gear for the system to operate properly.

3 The distance from the main propeller to the hydrophones should be greater than ten meters. A separation of less than ten meters can reduce system range significantly.

4 If thrusters are installed, hydrophones should be located at least four meters from them.

5 Avoid locating hydrophones behind thrusters where air bubbles from their tunnels generated when the vessel pounds can block sensor signals.

6 Hydrophone should not be placed forward of other underwater acoustic equipment and preferably behind it as far away as possible, distances of less than one meter should be avoided.

7 There should never be possible sources of underwater acoustic noise placed in front of hydrophones.

8 Remember that hydrophones are to be mounted with their long axis up (in the vertical plane).

9 Hydrophones installed in blisters should be located away from the vessel's keel and as deep as possible on the hull.

10 Hydrophones installed in shoes along the vessel's keel should be mounted as deeply as possible.

11 Hydrophone cables that are run in conduit along the outside of the vessels hull should be arranged as to produce the least amount of underwater acoustic noise as possible.

12 Blisters and shoes should be as streamlined as possible and have all of their corners rounded to minimize the generation of underwater acoustic noise.

13 Conduit used to run hydrophone cables in the interior of a vessel's hull should extend well over its water line.

14 If you install both trawl and purse seine hydrophones, do not confuse the two types. The Trawl hydrophones are marked with order number **314-205250**, while the Purse seine hydrophones are marked with order number **314-202275**.

15 Other well-founded information or experience regarding hydrophone installation be available should also be evaluated even though not directly mentioned in these instructions.

Optimal location of purse seine hydrophones

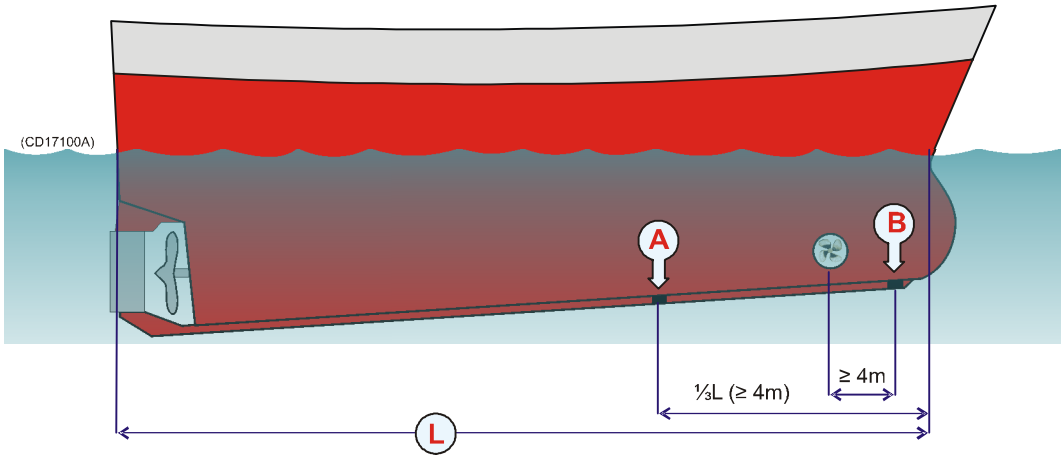
The most influential factors effecting hydrophone reception common to most vessels are:

- Noise from cavitation generated by the main propeller.
- Air bubbles in the water around the hydrophone which impede acoustic signals.
- Noise from other acoustic equipment mounted in close proximity.

Taking these main sources of disturbance into consideration, the generally recommended location for mounting a single hydrophone is approximately one third the vessel's water-line length from the bow.

Installations requiring the use of two hydrophones may position the first as described above and the second forward of the bow thruster in conjunction with the transducer shoe for the echo sounder. Both hydrophones must be located at least four meters from the bow thruster.

Optimal hydrophone placement differs from vessel to vessel. Variables effecting hydrophone performance must be understood so that the best location may be chosen given a vessel's design and particular operation.



The illustration shows the recommended fore (B) and aft (A) locations for single hydrophone locations. For a dual installation, both are used. (L) is the total length of the hull measured at the waterline.

Coverage area, orientation and tilt

General

Once the fore and aft placement of the purse seine hydrophone is decided, it is equally important to carefully consider its horizontal and vertical orientation. Hydrophone orientation can have a large influence on system performance.

The hydrophone's beam sensitivity is concentrated within a 90° horizontal and -30° vertical sector. Both keel and hull installations are to be located on the side of the vessel that the seine is shot.

Note: *These installation instructions and related drawings are for vessels shooting and pursing to **STARBOARD**.*

Horizontal coverage area

When the seine is normally located forward of the starboard beam when pursing the following information should be taken into consideration:

1 When the seine is pursed in the sector from approximately 000° to 120° relative to the bow, the hydrophone should be installed at an angle of 70° to the vessels centre line.

2 When the seine is pursed in the sector from approximately 030° to 150°relative to the bow, the hydrophone should be installed at an angle of 90° to the vessel's centre line.

The most important elements with regard to the horizontal coverage area of the hydrophone are:

1 An unobstructed line-of-sight to the PI54 sensor(s) attached to the purse seine.

2 The hydrophone is directed at the middle of the net when pursing.

3 Two hydrophones may be used for applications requiring a large coverage area.

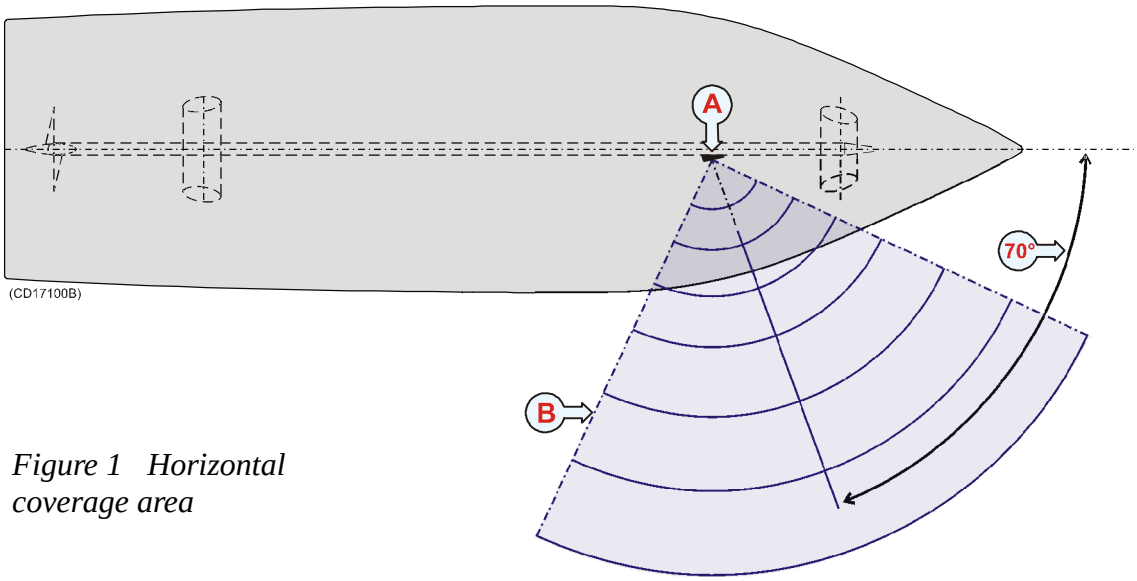


Figure 1 Horizontal coverage area

The illustration shows a hydrophone installed at an angle of 70 degrees to the vessel's center line.

(A) = The PI54 hydrophone

(B) = The horizontal coverage area

Vertical coverage area

The hydrophone has a vertical beam width of -30° and should be tilted so that the most important part of the seine is adequately covered. Tilt should be no less than -15° in most instances with the optimal tilt angle depending on the size (length/depth) of the seine in use. Heeling of the vessel after the seine is set must also be taken into consideration. For a large purse seine (about 1000m or longer) the recommend a tilt angle is -15° plus the estimated angle of heel when the net is set. For smaller and deeper seines it may be necessary to increase the tilt angle.

Tilt angle

The tilt angle is a function of net length and depth and may be estimated as follows:

α = -[arctan (depth/length $*$ π) - 15°+ β]

α = tilt angle

β = angle of heel (to port) after deploying the purse seine to starboard

The following table gives some examples of recommended tilt angles for common size pure seines:

Recommended tilt angles						
Net length/depth in meters	250 / 50	350 / 100	650 / 150	850 / 180	1500 / 200	2000 / 200
Recommended tilt angle *	-15°	-25°	-20°	-20°	-15°	-15°

*The tilt angle should be increased accordingly if the vessel heels after the seine is shot. Tilt angles of less than -15° are not recommended.

Mounting arrangement

The PI54 purse hydrophone are delivered ready for installation in either freestanding or keel mounted shoes (which are to be built by the shipyard responsible for the installation). Several alternatives with corresponding detailed drawings have been included in this manual to cover the majority of installation options available. Information regarding through-hull penetration is also described to compliment the rules and regulations of the respective vessel’s classification society.

Referenced drawings

→ *PI54 Purse hydrophone, outline dimensions, page 68*

→ *PI54 Purse hydrophone, cutout, page 69*

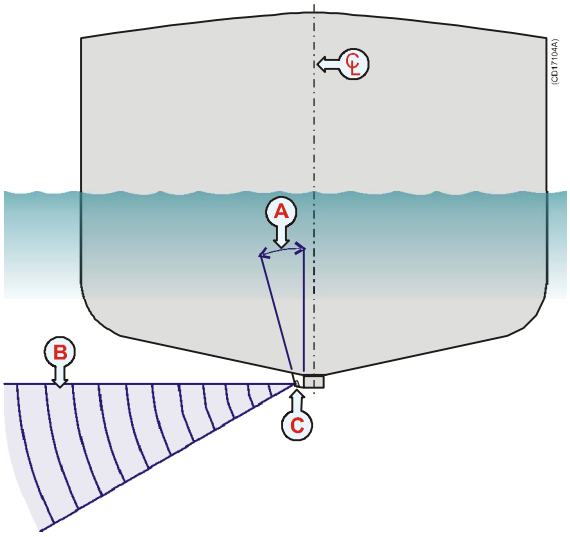
→ *Purse hydrophone, keel mounted, steel or aluminum, page 70*

→ *Purse hydrophone, keel mounted, sandwich or wood, page 73*

→ *Purse hydrophone, blister installation, page 76*

Keel mounted shoes

The hydrophone shoe may be keel mounted to avoid creating an appendage to the hull which may foul the purse wire.



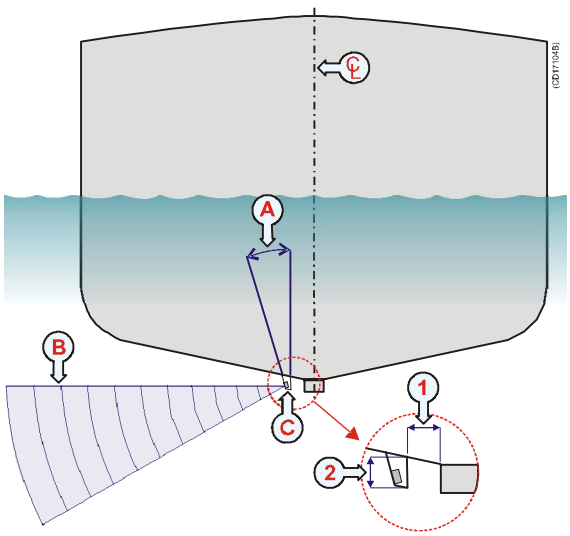
Keel mounted hydrophone shoe:
(A) = Tilt angel
(B) = Vertical coverage area
(C) = Keel mounted hydrophone with fairing

Should this solution be chosen, the following must be taken into consideration:

- The hydrophone must have an unobstructed line-of-sight to the PI54 sensor(s) attached to the seine.
- The centre of the hydrophone's beam must be directed as much as possible toward the bottom of the net where the PI54 sensors are located. The tilt angle must be increased with regard to the expected heel of the vessel.
- For a short and deep seine a tilt angle (A) of 20° to 25° is recommended. For a short and shallow or large seine a 15° tilt angle may be best.
- If monitoring of the headline under pursing is desired the hydrophone should not be tilted more than 15°.
- The hydrophone shoe must be mounted as deep as possible on the keel, but not so deep that it may be damaged while docking.
- The hydrophone shoe must be streamlined to avoid creating turbulence and underwater noise.
- For applications that require extensive coverage, regardless of net size, several hydrophones may be installed with different tilt angles.

Free standing hydrophone in blister

If there is no risk that hull protrusions will be fouled by the purse wire, mounting the hydrophone in a freestanding blister is a viable option.



Free standing hydrophone in blister:
(A) = Tilt angel
(B) = Vertical coverage area
(C) = Free standing hydrophone in blister (pipe diameter 200 to 250 mm)
(1) = Approximately 400 mm, minimum 250 mm is required
(2) = Must exceed 700 mm.

Should this solution be chosen, the following must be taken into consideration:

- The centre of the hydrophone's beam must be directed as much as possible toward the bottom of the net where the PI54 sensor(s) are located. The tilt angle should be increased with regard to the expected heel of the vessel.
- For a short and deep seine a tilt angle (A) of 20° to 25° is recommended. For a short and shallow or large seine a 15° tilt angle may be best.
- If monitoring of the headline under pursing is desired the hydrophone should not be tilted more than 15°.
- For applications that require extensive coverage, regardless of net size, several hydrophones may be installed with different tilt angles.

Dual hydrophone installation

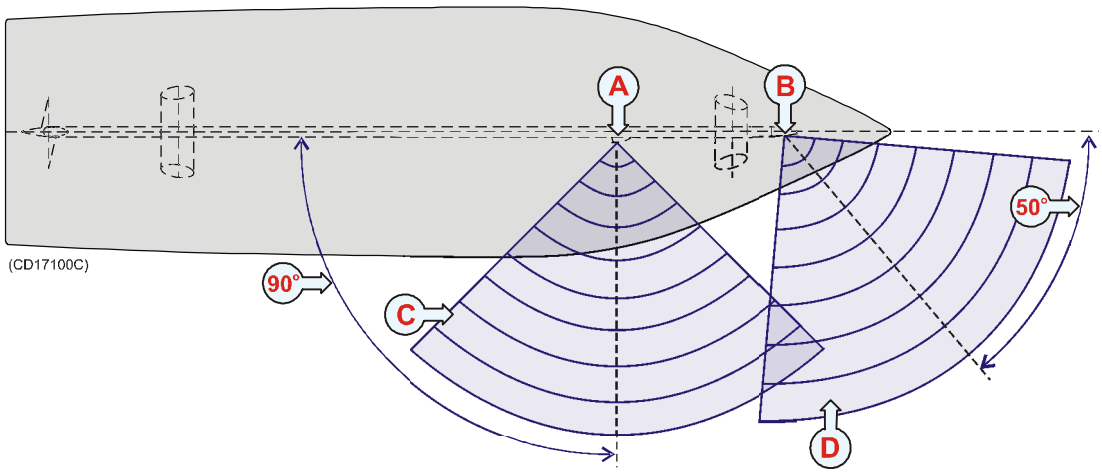
Large vessels and operations requiring a greater than normal coverage area can install two hydrophones with a vertical and horizontal overlap. Hydrophone selection is made with the help of a switch located in the wheelhouse.

To reduce the possibility of interference from air bubbles and underwater noise when reversing propulsion or using thrusters the two hydrophones should be located at least five meters from each other in the fore and aft plane. It is also recommended to install the two hydrophones with a slightly different tilt angles so that a larger vertical sector may be covered. Vessels equipped with a bowthruster or bulbous bow can install the first hydrophone forward of the bowthruster on the bulbous bow and the second aft of the bowthruster. Dual hydrophone installations may be either keel mounted or installed in free-standing blisters.

Horizontal coverage areas

When the seine is normally located forward of the starboard beam when pursing the following information should be taken into consideration:

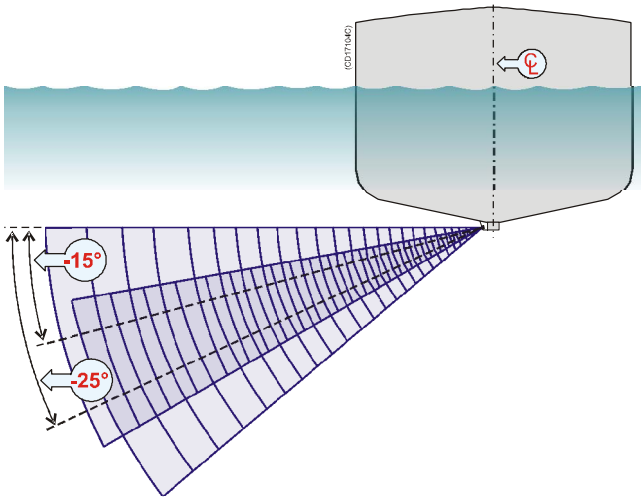
- When the seine is pursed in the sector from approximately 000° to about 130° relative to the bow, the foremost hydrophone should be installed at an angle of 50° and the after 90° to the vessel's centre line.
- Should special circumstances require coverage outside the standard 000° to 130° sector the hydrophones may be installed accordingly.



(A) = Aft hydrophone, (B) = Forward hydrophone
(C) and (D) = Horizontal coverage areas

Vertical coverage areas

When the seine is normally located forward of the starboard beam when pursing the following information should be taken into consideration:



- The optimal tilt angle for dual hydrophone installations is derived in the same manner as a for single hydrophone installations. Consult the section on Tilt angle for more information.
- The hydrophones should be tilted so that the most important part of the seine is adequately covered. Tilting the forward hydrophone -25° and the after -15° will provide proper coverage in most instances.
- Tilt should be no less than -15° in most instances with the optimal tilt angle depending on the size (length/depth) of the seine in use.
- Heeling of the vessel after the seine is set must be taken into consideration when calculating the tilt angle.

Hydrophone protection

Warning: ***Do not perform hot work near, paint, scrape, hit, pry, force, sandblast, high-pressure wash or otherwise subject hydrophones to excessive force.***

Installation precautions

The following precautions must be observed. Failure to do so can result in damage to the purse seine hydrophone which may render the PI54 system inoperative.

1 Do not install the hydrophone until all hot work is complete!

2 Do not over-tighten the packing nipple as this could damage the hydrophone's cable!

3 Observe the maximum allowable torque warning of 5 Nm when tightening hydrophone studs!

4 Use only stainless steel M8x35 socket countersunk head screws for mounting the hydrophone!

5 Secure threaded hydrophone hardware with Loctite™ 270 or the equivalent!

6 The PI54 cabinet should always be connected to the ship's ground to reduce the effects of electrical interference on the system!

Under installation

Hydrophones must not be installed until all structural work, specifically welding sandblasting and other potentially harmful operations are completed. If hot work, sandblasting, spay painting or water blasting is to be performed in the vicinity of a hydrophone it must be properly protected. PI54 hydrophones although very rugged, contain sensitive ceramic elements and electronic circuits and therefore should never be struck, prided, clamped or subject to other types of potentially damaging force as for example over-tightening mounting hardware.

Deflection plates

Simrad recommends that hydrophones mounted in blisters be protected by rope deflections plates both forward and aft. Such precautions will help protect the hydrophones, especially in the event the vessel passes over a wire, line or net.

Vessels operation in colder climates should weld steel fins and protection plates installed around hydrophones to protect them from being damaged by ice. Detailed drawing must be made specifically to suite each individual vessel in question and the installation performed by an authority with the expertise to do so.

Surface protection

Maintenance and replacement costs can be reduced if those parts of the hydrophone installation that are open to the sea are protected correctly. Any new metal or original plating involved in the hydrophone installation which has been cut, sand-blasted, welded or otherwise had its protective coating compromised must be thoroughly cleaned and repainted. For steel vessels use polyester primer, undercoat and top-coat according to the manufacture's instructions, then apply the same anti-fouling paint used on the rest of the hull.

Hydrophone face

This is Simrad's list of approved antifouling paints for hydrophone faces.

From Jotun Paints, Sandefjord Norway:

- Antifouling Seamate HB 33, HB 66 and HB 99
- Racing
- Non-stop

From International Paints:

- Intersleek tie coat + 425 FCS
  - BXA386/BXA390/BXA391 Grey
  - HKA563/HKA570/HKA571 Yellow

Mix BXA386, BXA390 and BXA391 first, then apply. When dry, mix HKA563, HKA570 and HKA571, apply.

From Hempel IFA Coatings AS:

- Hempel A/F Classic 76550

From Jotun-Henry Clark Ltd:

- Anti-fouling Seaguardian

From **International Marine Coatings**:

- Intersmooth 360 Ecoloflex SPC
- Micron Ekstra

Note: *Refer to the manufacturer's documentation and data sheets for a complete procedure.*

Location and marking

After installation, the location of hydrophones should be clearly marked on the vessel's hull (above the water-line) directly over them. This information will help prevent hydrophone damage when dry-docking the vessel. It is very important to amend the docking-plans of larger vessels to also reflect this information so that blocks will not be placed in the vicinity of hydrophones, fins, deflection plates or other associated appendages.

After installation / Sea trials

Once the installation is complete and the vessel afloat, the system's performance should be documented. Refer to the appropriate section in the PI54 Operation manual regarding the measurement of a noise vs. speed curve.

Hydrophone cable

The purse seine hydrophone is delivered with a 22 m cable. The cable is fitted with plug that fits the ANT socket on the rear side of the PI54 Operator Unit.

General cable gland guidelines

Hydrophone cables are passed through the hull using approved cable glands for the type of vessel in question. The standard delivery consists of a **steel** cable gland that is to be welded to the hull.

A **bronze** cable gland can be delivered as an option for vessels with wood or fibreglass construction. Vessel not to be classified can as an option use a cable gland made of **plastic**.

Note: *Simrad strongly recommends that a length of conduit be fitted around hydrophone cable glands made of steel or bronze and extended over the water-line inside the vessel. This precaution reduces the danger of flooding in the event of gland failure and hydrophones installed in this manner are also easier to replace.*

Some vessels may experience difficulties finding suitable areas of the hull for mounting hydrophone cable glands due to existing water tanks, concrete ballast or other obstacles. A possible solution in such cases is to run the hydrophone cables in a steel conduit aft along the hull until a suitable cable gland location is available. The respective cable gland can then be installed as described in the following instructions.

Note: *Simrad takes no responsibility for the correct installation of cable glands, associated hull modifications and/or structural support of hydrophone cable penetration. These activities are subject to individual approval by the respective classification society for the vessel in question.*

Order numbers

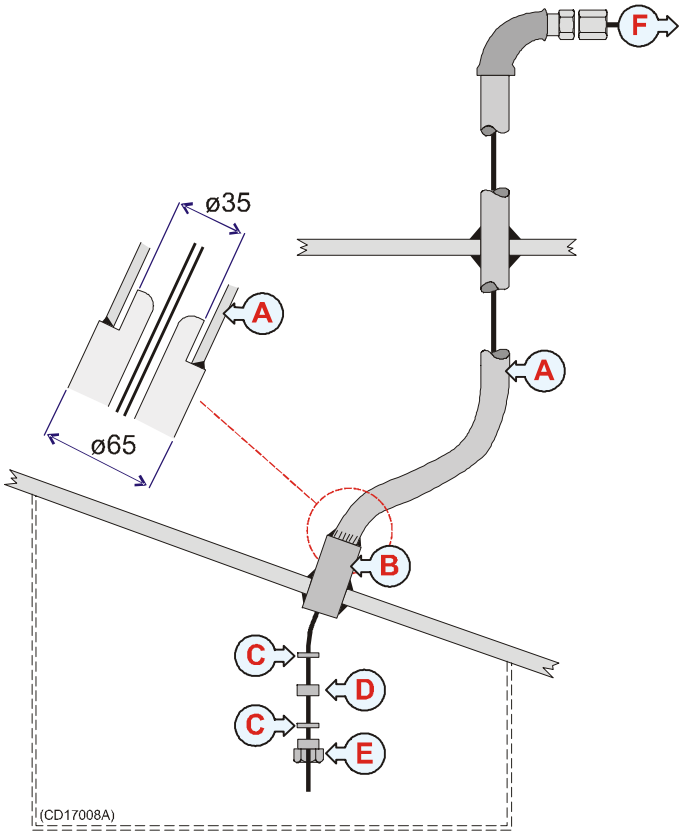
Steel hull cable gland kit: 599-202216

Wood/GRP hull cable gland kit: 119-038200

Small vessel cable gland kit: 599-202182

Cable gland installation for steel hulls

The cable gland kit for steel vessels is included with standard deliveries. The drawing shows a single hydrophone, but normally a typical installation includes two hydrophones with respective cables spliced in a junction box and run to the wheelhouse in a conduit.



Cable gland for steel hull vessels.

(A) = Steel conduit

(B) = Stuffing tube, DNV approved carbon steel st52.3

(C) = Washers, 24 x 8 x 2 mm

(D) = Rubber gasket

(E) = Packing nipple. Make sure that you do not damage the hydrophone cable by tightening the packing nipple too hard!

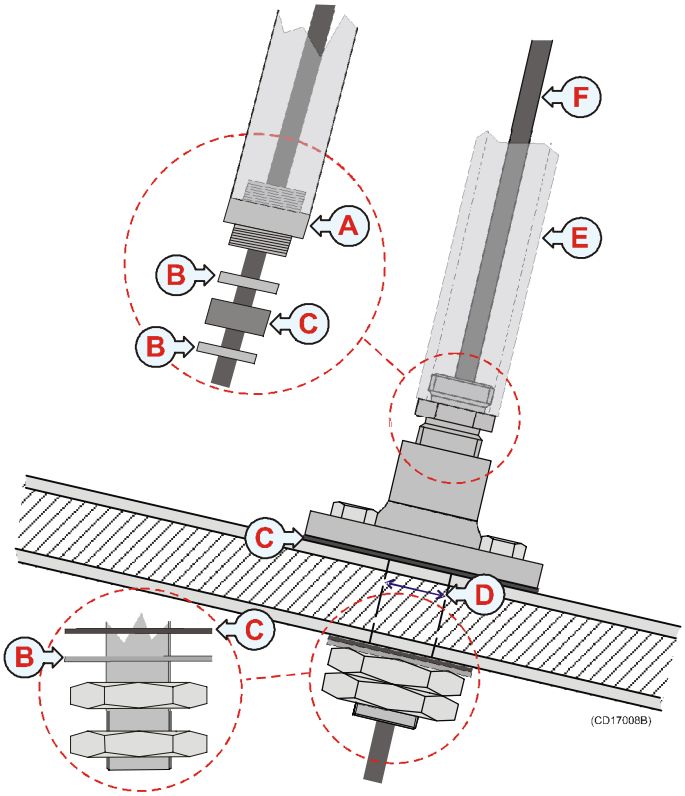
(F) = Cable to the PI Operator unit (or a junction box)

The gland gland kit includes all of the necessary parts needed to install the unit excluding screws.

Gland installation for wood or GRP hulled vessels

A bronze cable gland kit is available for wood and GRP vessels. This kit is not included in the standard delivery, and must be ordered separately.

The drawing shows a single hydrophone, but normally a typical installation includes two hydrophones with respective cables spliced in a junction box and run to the wheelhouse in a conduit.



Cable gland for wood and GRP hulls.

(A) = Packing nipple. Make sure that you do not damage the hydrophone cable by tightening the packing nipple too hard!

(B) = Washers

(C) = Rubber gaskets

(D) = Hole diameter 28 mm

(E) = Steel conduit

(F) = Hydrophone cable

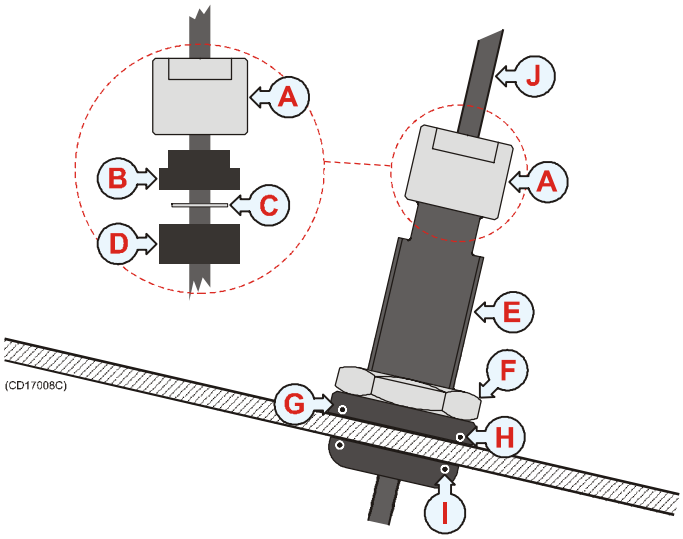
The gland gland kit includes all of the necessary parts needed to install the unit excluding screws.

Simrad recommends that a one inch conduit (that the hydrophone cable will be run through) with an inside threaded diameter of three-quarter inches be attached to the gland's packing nipple. This connection must be watertight, and the conduit must extend to over the vessel's water line and terminated as described for steel hulled vessels.

Cable gland installation for smaller vessels

Cable glands made of plastic for those smaller vessels that do njot need to be classified are optional equipment for standard deliveries. This cable gland kit is not included in the standard delivery, and must be ordered separately.

The drawing shows a single hydrophone, but normally a typical installation includes two hydrophones with respective cables spliced in a junction box and run to the wheelhouse in a conduit.



Hydrophone cable gland for small vessels.

(A) = Packing nut (bronze). Ensure that you do not to damage the hydrophone cable by tightening the packing nut too hard!

(B) = Rubber gasket

(C) = Plastic disk

(D) = Rubber gasket

(E) = Stuffing tube

(F) = Backing nut (bronze)

(G) = Backing washer (plastic)

(H) = O-ring 42.5 x 3.0 N

(I) = O-ring 39.5 x 3.0 N

(J) = Hydrophone cable

Stuffing tube hole diameter: 36 mm ±1.5 mm.

Apply ample amount of sealant between the backing washer (H) and the hull plate.

The cable gland kit contains all the listed parts, except the sealant.

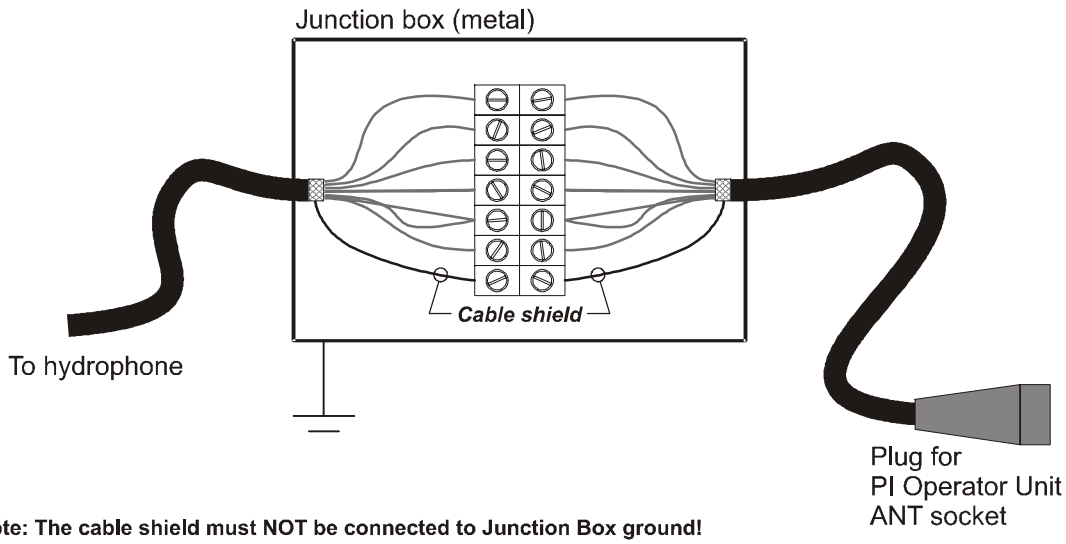
Note: *The two O-rings must be clean, in good condition and free of cuts or other defects which could affect their water-tight integrity.*

Splicing

If you need to cut the cable, you must splice it correctly.

Note: *DO NOT solder the wires together with only electrical tape for insulation, as this will result in electrical noise and reduced operational performance.*

To splice the cable, use a metal junction box. The chassis of the junction box must be grounded, but the cable shielding must NOT be connected to the junction box ground.



W813A / Rev.A	PI Hydrophone cable with Junction box

Note: *Make sure that you connect the cables 1:1! The red cable in the "input" cable MUST be connected to the red cable in the "output" cable etc.*

Cable specification

If extension cables are used, these must be supplied by the installation shipyard. The following specifications must be regarded as a minimum:

2 x 2 x 0.5 mm^2 / Twisted pairs / Overall braided

Observe the information regarding cable splicing.

Grounding and shielding

Cable shielding must be continuous. The shielding is terminated in the cabinet and must not be grounded in the junction boxes.

In order to minimize electrical interference, Simrad strongly recommends that the hydrophone cable is installed in a metal conduit between the hydrophone and the PI54 cabinet.

Installation drawings

Observe the following drawings. The drawings are also available on electronic format (DWG or PDF), consult your local dealer.

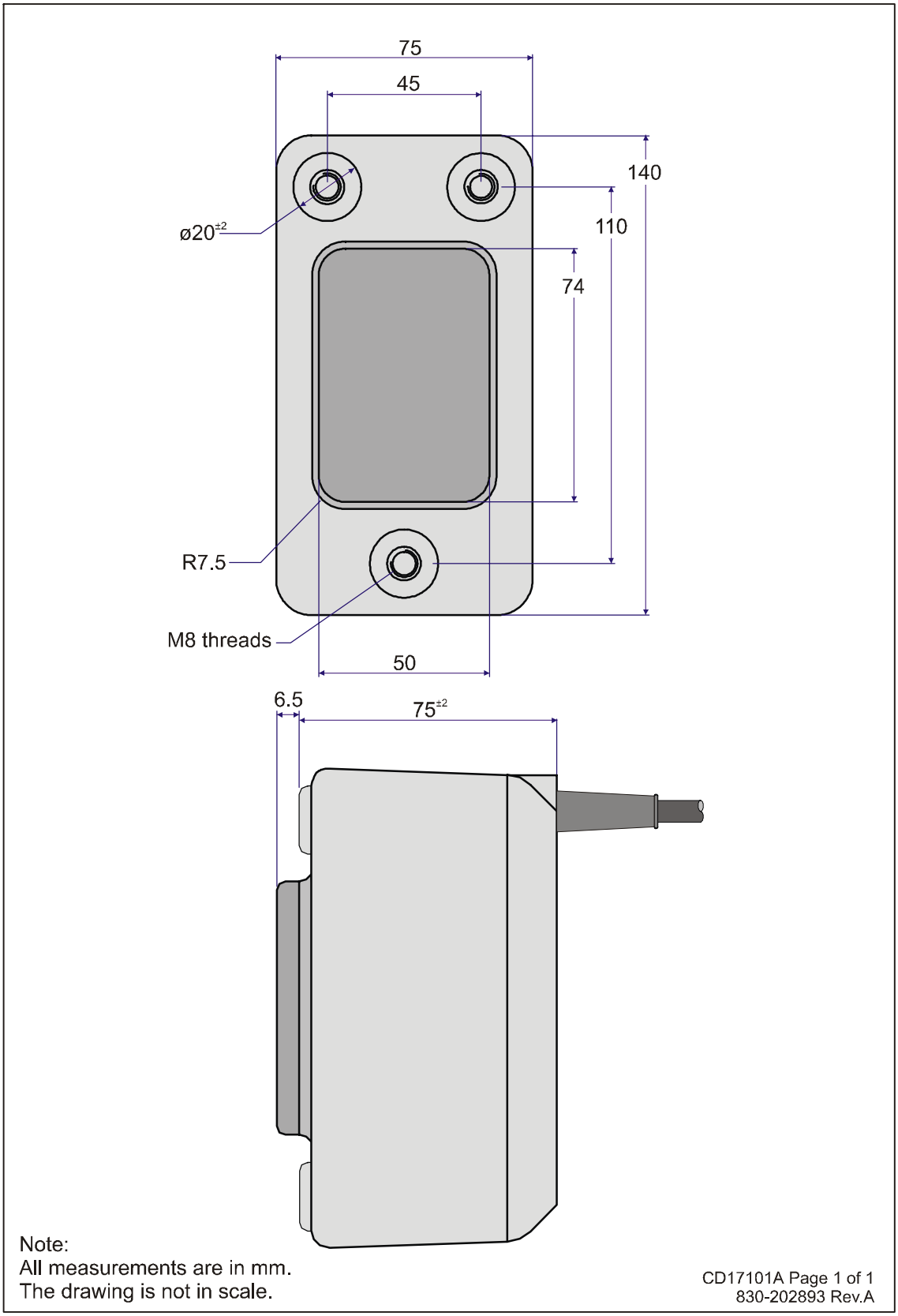
→ *PI54 Purse hydrophone, outline dimensions, page 68*

→ *PI54 Purse hydrophone, cutout, page 69*

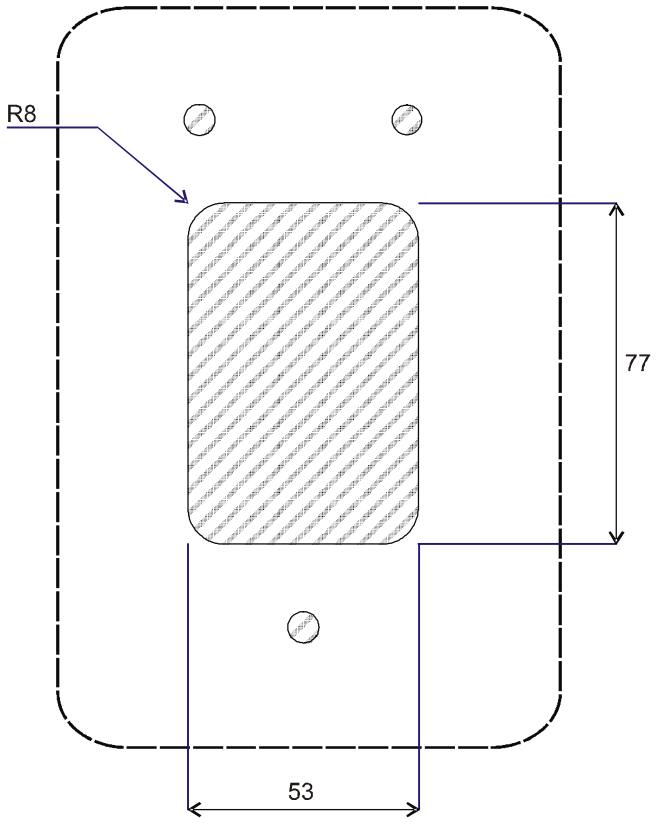
→ *Purse hydrophone, keel mounted, steel or aluminum, page 70*

→ *Purse hydrophone, keel mounted, sandwich or wood, page 73*

→ *Purse hydrophone, blister installation, page 76*



PI54 Purse Seine hydrophone - Outline dimensions



Maximum plate thickness: 6 mm

Note: No sharp edges in mounting plate!

Note:
All measurements are in mm.
The drawing is not in scale.

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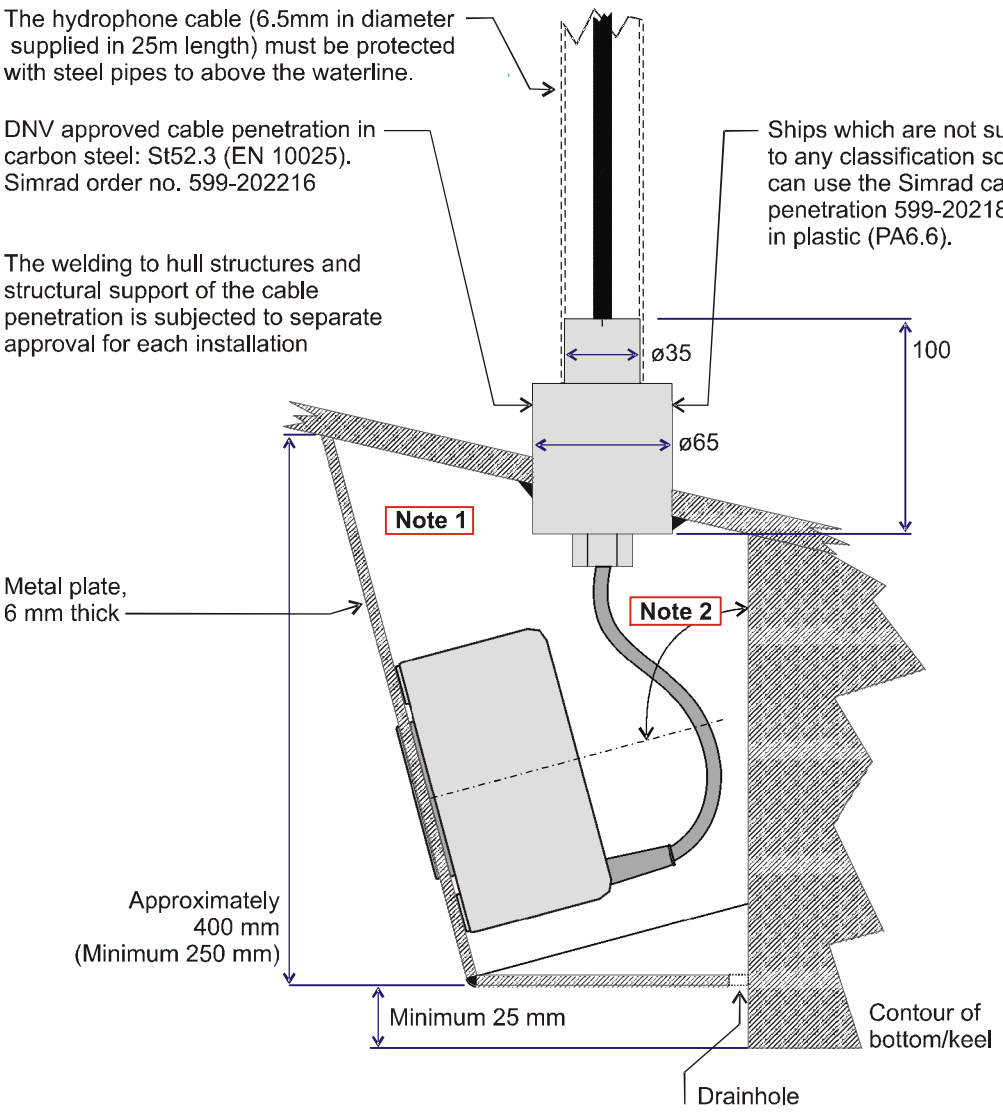
PI54 Purse Seine hydrophone - Cutout

Cross section (seen from bow)


The hydrophone cable (6.5mm in diameter supplied in 25m length) must be protected with steel pipes to above the waterline.
DNV approved cable penetration in carbon steel: St52.3 (EN 10025). Simrad order no. 599-202216
The welding to hull structures and structural support of the cable penetration is subjected to separate approval for each installation
Ships which are not subjected to any classification society can use the Simrad cable penetration 599-20218 in plastic (PA6.6).
ø35
100
ø65
Note 1
Note 2
Metal plate, 6 mm thick
Approximately 400 mm (Minimum 250 mm)
Minimum 25 mm
Contour of bottom/keel
Drainhole

Note 1: Install the hydrophone on the side of the ship corresponding to the direction which the Purse Seine is set, normally on the starboard side.

Note 2: The beam angle of the hydrophone is 90° horisontally and 30° vertically. Recommended tilt angle ca. 15-25° dependent on the application. To compensate for possible heel after shooting the purse seine, increase the tilt angle of the hydrophone accordingly

Note:
All measurements are in mm.
The drawing is not in scale.

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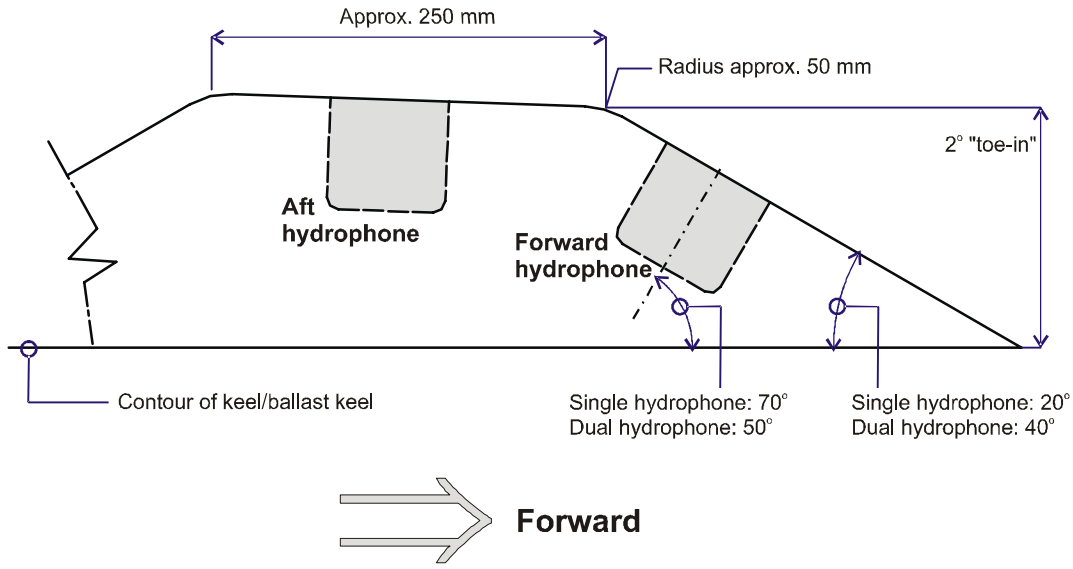
821-203060 Rev.B Page 1 of 3

PI54 Purse Seine hydrophone - Keel mounted hydrophone, steel hull - Page 1

Starboard fairing (seen from below)

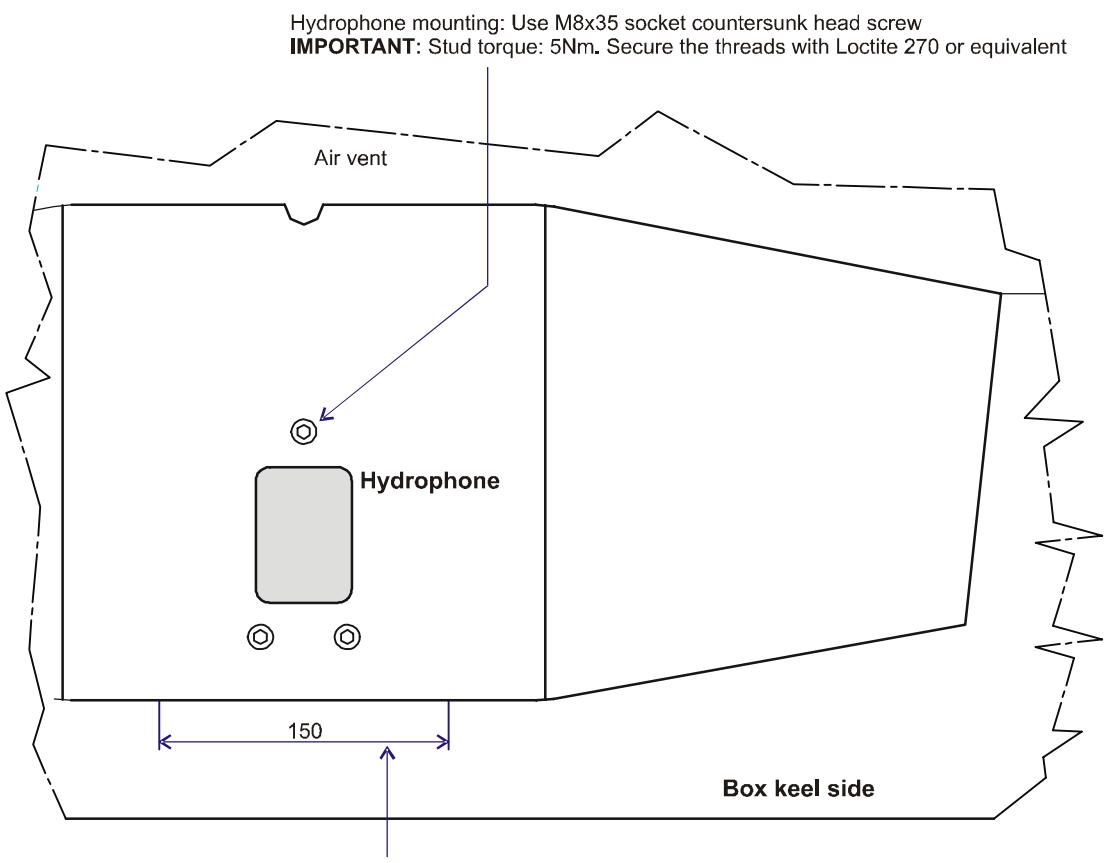


Note:
All measurements are in mm.
The drawing is not in scale.

CD17102B
821-203060 Rev.B Page 2 of 3

PI54 Purse Seine hydrophone - Keel mounted hydrophone, steel hull - Page 2

Side view


Hydrophone mounting: Use M8x35 socket countersunk head screw
IMPORTANT: Stud torque: 5Nm. Secure the threads with Loctite 270 or equivalent
Air vent
Hydrophone
150
Box keel side
No welding between the fairings bottom and side plate in this area!

After mounting the hydrophone, all welding must be done carefullya, and with cooling!

Note:
All measurements are in mm.
The drawing is not in scale.

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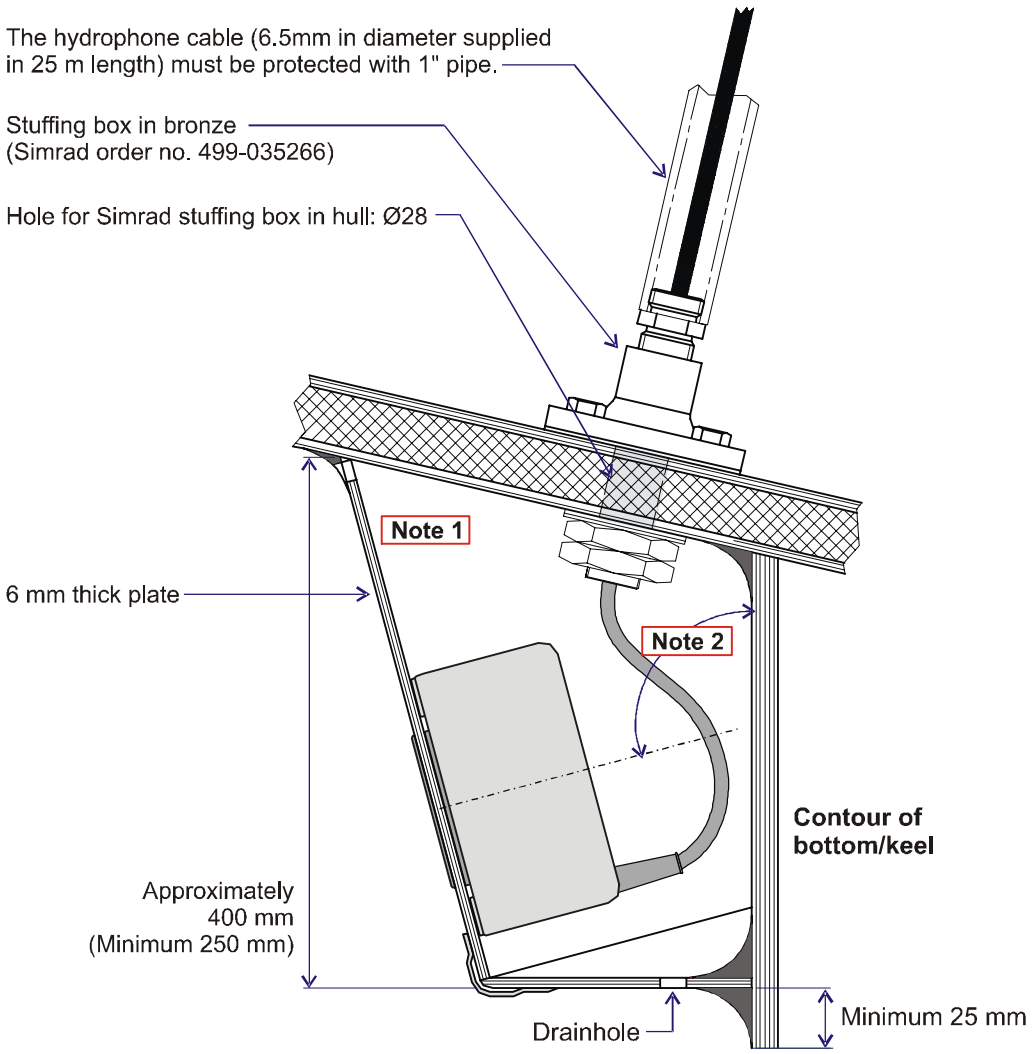
821-203060 Rev.B Page 3 of 3

PI54 Purse Seine hydrophone - Keel mounted hydrophone, steel hull - Page 3

Cross section (seen from bow)


The hydrophone cable (6.5mm in diameter supplied in 25 m length) must be protected with 1" pipe.
Stuffing box in bronze (Simrad order no. 499-035266)
Hole for Simrad stuffing box in hull: Ø28
Note 1
6 mm thick plate
Note 2
Contour of bottom/keel
Approximately 400 mm (Minimum 250 mm)
Drainhole
Minimum 25 mm

Note 1: Install the hydrophone on the side of the ship corresponding to the direction which the Purse Seine is set, normally on the starboard side.

Note 2: The beam angle of the hydrophone is 90° horisontally and 30° vertically. Recommended tilt angle ca. 15-25° dependent on the application. To compensate for possible heel after shooting the purse seine, increase the tilt angle of the hydrophone accordingly

Note:
All measurements are in mm.
The drawing is not in scale.

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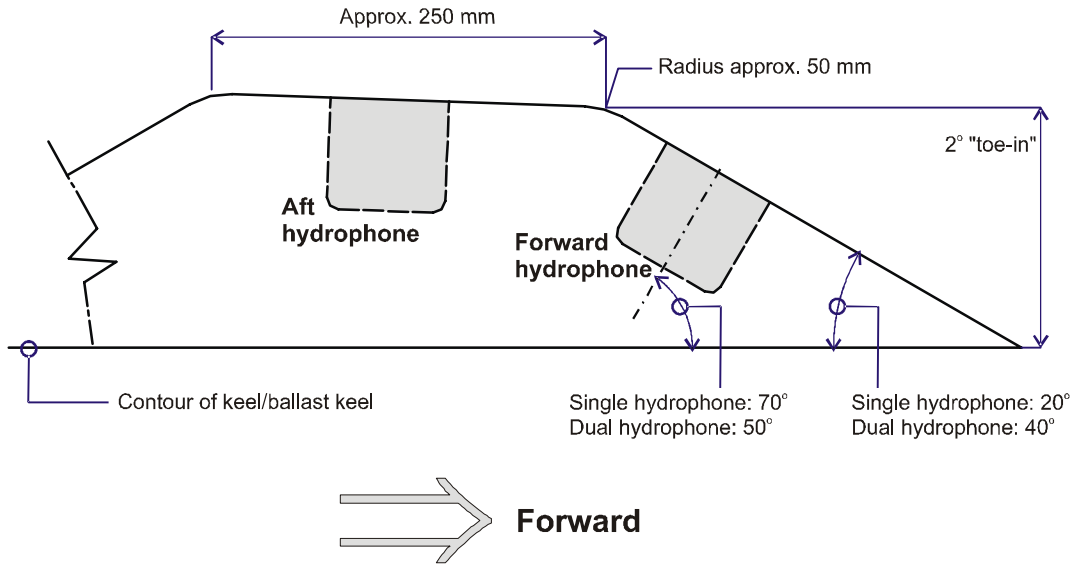
821-202912 Rev.B Page 1 of 3

PI54 Purse Seine hydrophone - Keel mounted hydrophone, wooden hull - Page 1

Starboard fairing (seen from below)

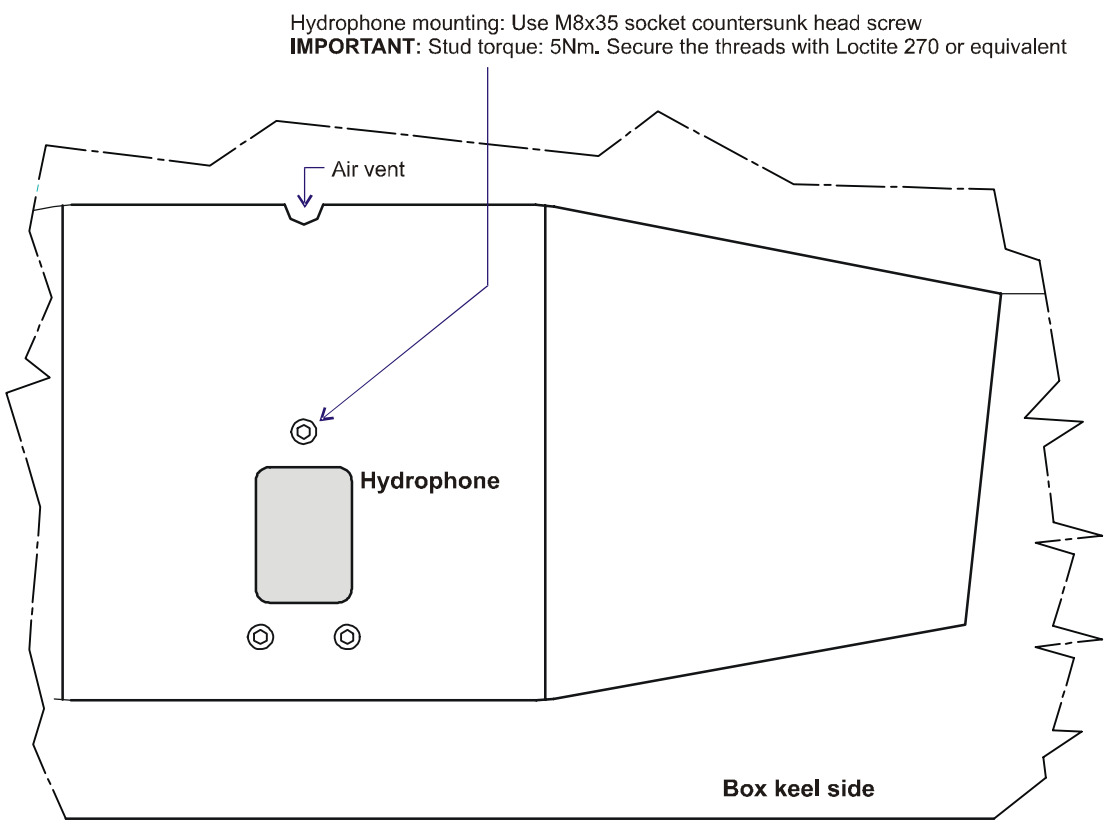


Note:
All measurements are in mm.
The drawing is not in scale.

CD17103B
821-202912 Rev.B Page 2 of 3

PI54 Purse Seine hydrophone - Keel mounted hydrophone, wooden hull - Page 2

Side view


Hydrophone mounting: Use M8x35 socket countersunk head screw
IMPORTANT: Stud torque: 5Nm. Secure the threads with Loctite 270 or equivalent
Air vent
Hydrophone
Box keel side

Note:
All measurements are in mm.
The drawing is not in scale.

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821-202912 Rev.B Page 3 of 3

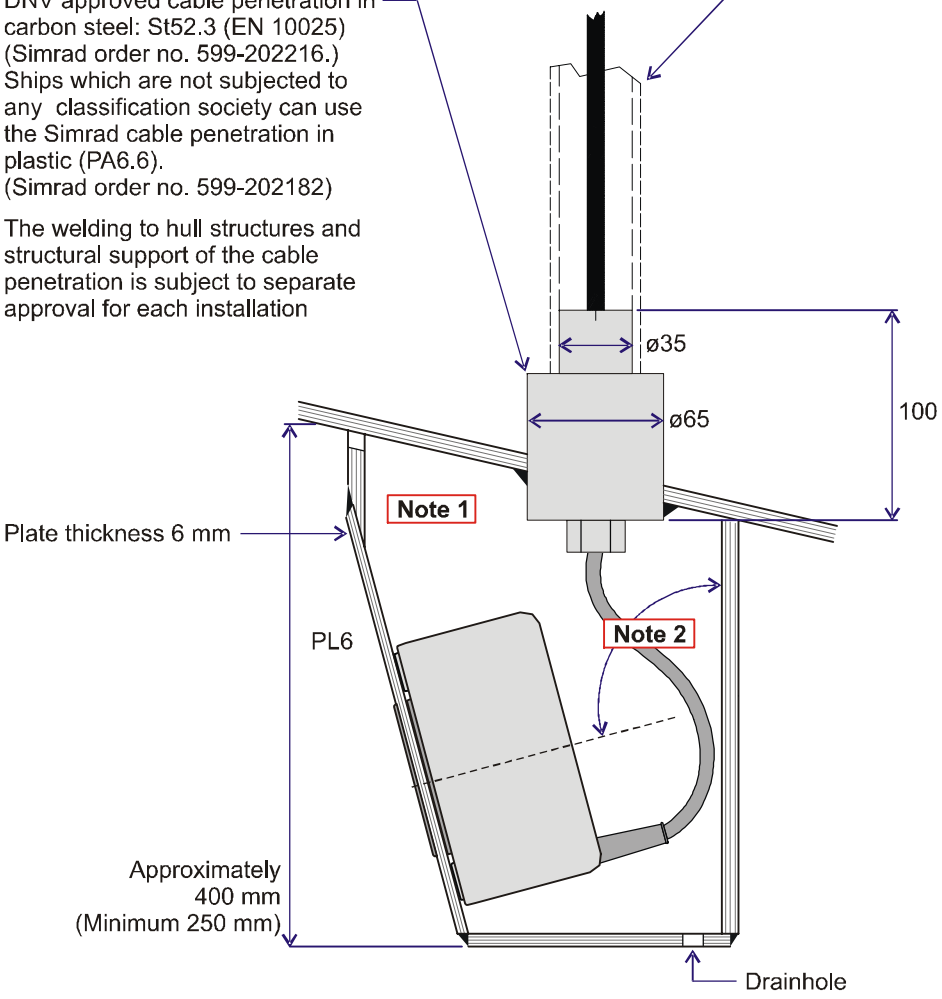
PI54 Purse Seine hydrophone - Keel mounted hydrophone, wooden hull - Page 3

Cross section (seen from bow)

The hydrophone cable (6.5 mm in diameter, supplied in 22 m length) must be protected with steel pipes to above waterline

DNV approved cable penetration in carbon steel: St52.3 (EN 10025) (Simrad order no. 599-202216.) Ships which are not subjected to any classification society can use the Simrad cable penetration in plastic (PA6.6). (Simrad order no. 599-202182)

The welding to hull structures and structural support of the cable penetration is subject to separate approval for each installation



Note 1: Install the hydrophone on the side of the ship corresponding to the direction which the Purse Seine is set, normally on the starboard side.

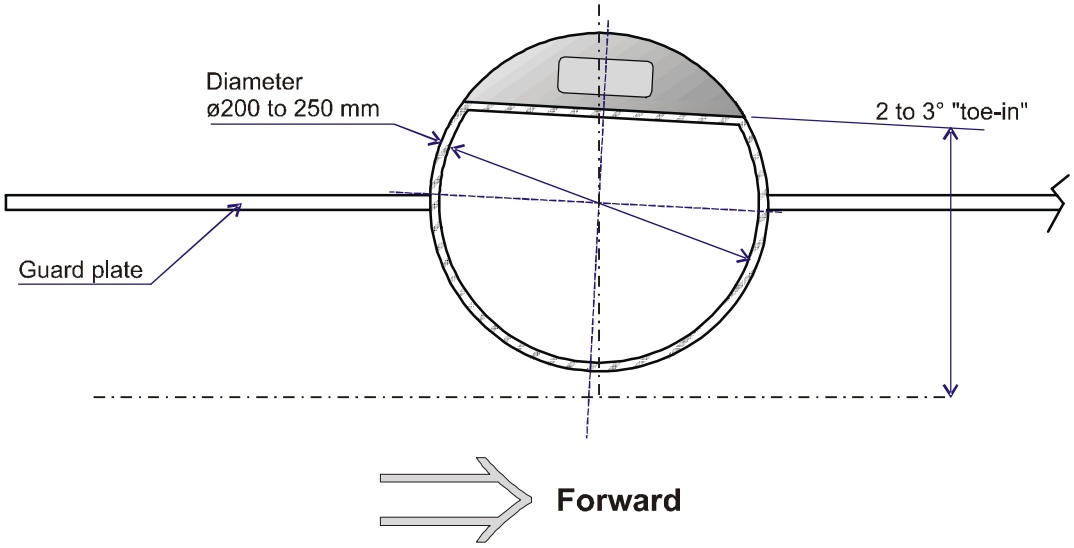
Note 2: The beam angle of the hydrophone is 90° horisontally and 30° vertically. Recommended tilt angle ca. 15-25° dependent on the application. To compensate for possible heel after shooting the purse seine, increase the tilt angle of the hydrophone accordingly.

Note:
All measurements are in mm.
The drawing is not in scale.

CD17105A
821-203072 Rev.B Page 1 of 3

PI54 Purse Seine hydrophone - blister installation on steel hull - Page 1

Starboard fairing (seen from below)



Note:
All measurements are in mm.
The drawing is not in scale.

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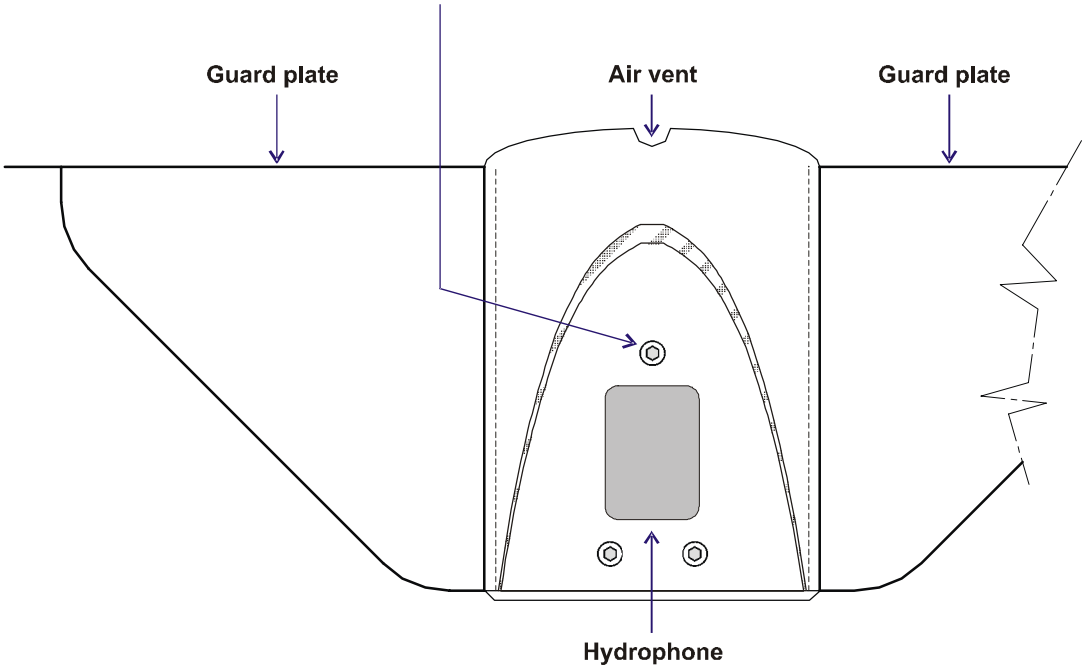
821-203072 Rev.B Page 2 of 3

PI54 Purse Seine hydrophone - blister installation on steel hull - Page 2

Side view

For hydrophone mounting, use M8x35 socket countersunk head screw.
IMPORTANT! Stud torque: 5 Nm**.** Secure the threads with Loctite 270 or equivalent**.**



NOTE:
After mounting of the hydrophone, all welding must be done carefully with cooling.

Note:
All measurements are in mm.
The drawing is not in scale.

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821-203072 Rev.B Page 3 of 3

PI54 Purse Seine hydrophone - blister installation on steel hull - Page 3

4 TRAWL HYDROPHONE

Purpose

The purpose of this chapter is to provide general guidelines for the installation of the PI54 hydrophone for **trawl**..

Note: *If your vessel shall be fitted for purse seine operations, DO NOT install the hydrophone(s) as explained in this chapter!*

Order numbers

Trawl hydrophone, complete: HYD-205254

Trawl hydrophone, without cable gland: HYD-205826

Topics

→ *Precautions, page 80*
→ *Considerations, page 81*
→ *Pre-installation checklist, page 86*
→ *Location, page 88*
→ *Coverage area, orientation and tilt, page 91*
→ *Mounting arrangement, page 95*
→ *Dual hydrophones, page 101*
→ *Hydrophone protection, page 102*
→ *Hydrophone cable, page 105*
→ *Installation drawings, page 110*

Installation precautions

Caution: *The following precautions must be observed. Failure to do so can result in damage to the hydrophone which may render the PI54 catch monitoring system inoperative.*

1 Observe the maximum allowable torque warning of 5 Nm when tightening the hydrophone studs.

2 Use only M8x35 socket countersunk head screws for mounting the hydrophone.

3 Secure threaded hydrophone hardware with Loctite™ 270 or the equivalent.

4 Do not paint the hydrophone.

5 Do not sand-blast, power or steam wash the hydrophone.

6 Do not scrape the hydrophone with metal or other hard objects that may damage the polyurethane sheathing.

7 Do not strike the hydrophone.

8 Do not expose the hydrophone to harsh chemicals.

9 Do not perform hot work in the vicinity of the hydrophone.

10 Do not lift the hydrophone by its cable.

Considerations

Correct installation of PI54 hydrophone(s) is vital to system performance. Several variables must be taken into consideration, the most important of which is the vessel's construction. This guide is for use in selecting the best location for the hydrophone and includes a brief description of areas to be avoided.

Note: *Simrad strongly suggests that this information is read thoroughly, and that the instructions are understood and followed. Proper hydrophone placement is difficult to achieve, but essential for correct system operation.*

Depth

Water just below the sea surface contains a myriad of small air bubbles created by the turbulence of breaking waves. The first five to ten metres may be heavily saturated in moderate seas with the greatest concentration and largest bubbles closest the surface. Air bubbles disrupt sound waves in water. The degree to which they absorb and reflect such energy vary, but in some cases they can block hydrophone reception. It is therefore recommended to mount the unit as deep as possible.

Pounding danger

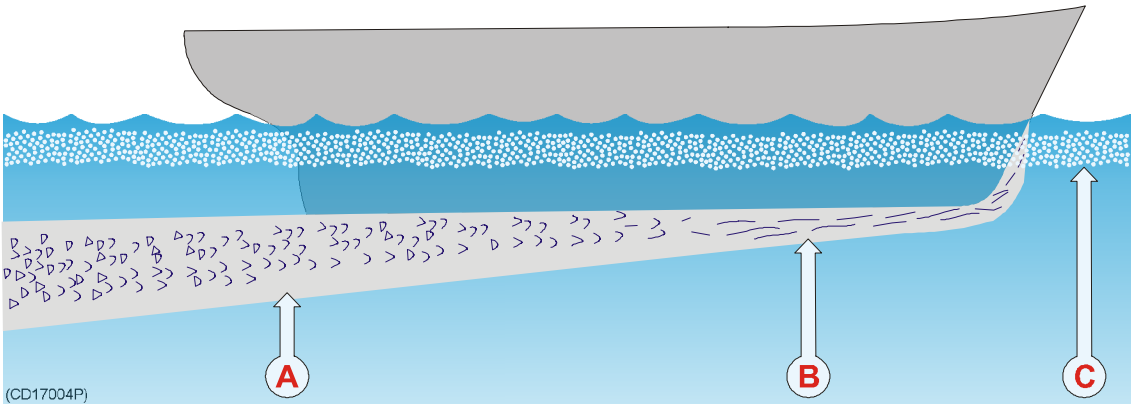
When a vessel is in ballast and pitching in heavy seas, it is important that the hydrophone is not lifted out of the water. Should a vessel pound so heavily that the hydrophone be exposed, sound reception will be interrupted and the unit may be damaged on impact.

The boundary layer

The flow of water in the immediate vicinity of the hull of a moving vessel is known as a boundary layer. This flow is responsible for underwater noise that can disturb hydrophone reception and its thickness is contingent on a vessel's:

- Hull form
- Size and number of underwater protrusions
- Velocity
- Hull roughness

The boundary layer is thin (laminar flow) near the vessel's bow and becomes thicker (turbulent flow) as it moves aft. Laminar flow is smooth with streamlines approximately parallel to the hull and contributes relatively little to noise created by flow. Conversely, turbulent flow is more disorderly and in turn contributes to a greater extent.



Boundary water layers:

(A) = Turbulent flow

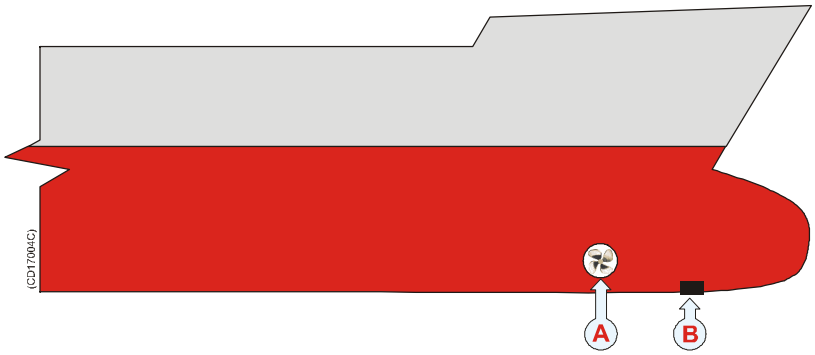
(B) = Laminar flow

(C) = Air bubbles in the water

Air bubbles may also be introduced into the boundary layer. If the vessel's hull has little flare and is relatively narrow, bubbles may escape to the sea surface without incident. On the other hand a wide, flat hull with minimal deadrise is prone to trapping air bubbles no matter how little flare it has. Regardless of a vessel's hull form, hydrophones are generally recommended to be installed on the forward part of the hull to minimising the influence of both turbulence and air bubbles.

Bulbous bow

The bulbous bow may be an acceptable hydrophone location. Should this position be chosen, the foremost part of the bulb is often best, but also the most susceptible to pounding.



Recommended location of the hydrophone on a bulbous hull:

(A) = Thruster

(B) = Hydrophone location

Propeller noise

A vessel's main propeller is the dominant source of underwater acoustic noise. When ever possible, hydrophone(s) should be located as far a way as possible from the main propeller and never closer than ten meters. Hydrophone(s) should not be mounted in the direct acoustic path (line-of-sight) of the main propeller unless absolutely necessary.

The primary cause of propeller noise is cavitation (small bubbles generated by the partial vacuum created by the blades as they pass through the water). The resulting underwater acoustic noise from cavitation is normally weakest on the side of the vessel were the propeller blades rotate toward the surface and most pronounced on the side were they rotate toward the bottom. Most vessels have clock-wise rotating propellers resulting in their port sides being less effected by cavitation induced noise than their starboard.

To minimise the negative effect of cavitation noise on hydrophone performance, installation is generally recommended as follows:

- **Single hydrophone -** if only one hydrophone is to be installed on a vessel with a clock-wise rotating propeller, it should be located on the port side of the hull.
- **Dual hydrophones -** if two hydrophones are to be installed, they should be placed on either side of the vessel's keel. When in doubt about the best fore-and-aft location for hydrophones, they can be placed at different distances from the bow (for example the port hydrophone can be a little further aft than the starboard, approximately three to five meters for a thirty-five meter vessel). When trawling in both deep and shallow water the hydrophones should also be tilted differently with respect to each other. The hydrophone that is closest to the propeller should have the greatest tilt and be located on the port side of the hull for a vessels with clock-wise rotating propellers.

Bow / sternthruster noise

Bow and sternthruster operation may severely effect hydrophone reception. Hydrophone installation closer than four meters to either is strongly discouraged.

When not in operation, bow/sternthruster tunnels create turbulence and hence underwater noise when a vessel is under way. Also, as a vessel pitches in heavy weather, thruster tunnels may fill with air or aerated water which can disturb hydrophone reception when released. Hydrophone installation should take into regard the noise and down stream disturbances found around and aft of thrusters.

Note: *Hydrophone installation must take into regard the noise and down stream disturbances found around and aft of thrusters.*

Noise from protruding objects and other sources

The primary sources of underwater disturbance (other than a vessel's main propeller and bow/sternthruster) that affect hydrophone reception are:

- Main or bilge keels
- Zinc anodes
- Cooling elements protruding from the hull
- Equipment such as sonar hydrophones and pitot tubes
- Sea chests
- Overboard discharges
- Dents in the hull

All appendages to the hull, indentations and pipe outlets are potential sources of underwater noise. They may act as resonant cavities amplifying noise at certain frequencies, create cavitation or turbulence. Hydrophones should not be located in the vicinity of such objects and especially not immediately aft of them.

Minimum distance to sonar and echo sounder transducers

To avoid interference, PI54 hydrophone(s) must be installed as far away as possible from other sources of underwater acoustical energy such as active sonars and echo sounder transducers. Hydrophones should be placed at least two meters from such equipment when ever possible and distances of less than one meter avoided. Hydrophones installed in close proximity to underwater acoustical sources should be located as far aft as possible from them, and most importantly, not be subjected to direct (frontal) transmission from such equipment.

Drop keel

In the event the vessel is equipped with a drop keel, the hydrophones should be mounted aft of it. The choice between installing a one, or two hydrophone system should be based on the same horizontal and vertical coverage requirements for vessels operating under similar conditions with fixed keels.

Pre-installation check-list

Choosing the optimal locations for hydrophones is not always easy, but decisions made at this phase of the installation process are critical to future system performance. Determining the best configuration for a given vessel often involves a compromise between contradicting requirements.

To aid in this evaluation process Simrad recommends that this installation manual be read thoroughly and the following check list completed before deciding on a final installation strategy for the PI54 system.

1 Hydrophones do not have a direct line-of-sight to the main propeller and are placed where the vessel's hull protects them from underwater acoustic noise as well as possible.

2 Hydrophones must always have an unobstructed line-of-sight to the sensors attached to the gear for the system to operate properly.

3 The distance from the main propeller to the hydrophones should be greater than ten meters. A separation of less than ten meters can reduce system range significantly.

4 If thrusters are installed, hydrophones should be located at least four meters from them.

5 Avoid locating hydrophones behind thrusters where air bubbles from their tunnels generated when the vessel pounds can block sensor signals.

6 Hydrophone should not be placed forward of other underwater acoustic equipment and preferably behind it as far away as possible, distances of less than one meter should be avoided.

7 There should never be possible sources of underwater acoustic noise placed in front of hydrophones.

8 Hydrophones should be offset twenty degrees from the vessel's centre line for normal single boat trawling. This provides a ten degree overlap and a coverage area of ninety degrees aft. Refer to the corresponding sections of this manual for more information.

9 If there is any doubt about the best fore-and-aft location, the port hydrophone can be placed a little farther aft (three to five meters) in relation to the starboard. Hydrophones can be tilted at slightly different angles when operating in both deep and shallow waters. Refer to the corresponding sections of this manual for more information.

10 The hydrophone that is closest to the main propeller should be located on the port side of the vessel and have the greatest tilt.

11 If both hydrophone are located equally distant from the main propeller, but are tilted differently, the starboard hydrophone should be tilted the most because underwater acoustic noise is more prevalent on that side of the vessel.

12 Locating hydrophones at the after end of a bulbous bow can produce good results. Previously installed sonars in this area that can subject hydrophones to direct signals will produce interference.

13 Hydrophone can also be mounted in the after end of echo sounder shoes as long as the minimum required distances and orientation with regard to other underwater acoustic equipment is observed.

14 Remember that hydrophones are to be mounted with their long axis up (in the vertical plane).

15 Hydrophones installed in blisters should be located away from the vessel's keel and as deep as possible on the hull.

16 Hydrophones installed in shoes along the vessel's keel should be mounted as deeply as possible.

17 Hydrophone cables that are run in conduit along the outside of the vessels hull should be arranged as to produce the least amount of underwater acoustic noise as possible.

18 Blisters and shoes should be as streamlined as possible and have all of their corners rounded to minimize the generation of underwater acoustic noise.

19 Conduit used to run hydrophone cables in the interior of a vessel's hull should extend well over its water line.

20 If you install both trawl and purse seine hydrophones, do not confuse the two types. The Trawl hydrophones are marked with order number **314-205250**, while the Purse seine hydrophones are marked with order number **314-202275**.

21 Other well-founded information or experience regarding hydrophone installation be available should also be evaluated even though not directly mentioned in these instructions.

Optimal location of trawl hydrophones

The most influential factors effecting hydrophone reception common to most vessels are:

- Noise from cavitation generated by the main propeller.
- Air bubbles in the water around the hydrophone which impede acoustic signals.
- Noise from other acoustic equipment mounted in close proximity.

If the shipyard or persons responsible for placement and mounting the hydrophone(s) have knowledge and the proper experience with installation of similar equipment, it should be fully exploited when deciding where to locate the hydrophones. This also holds true for adjusting the degree to which a hydrophone should be tilted with regard to the both the vessel's physical characteristics and fishing method. Proper hydrophone installation can increase overall system performance more than any other single factor and therefore it is important that all the variables involved be understood and taken into account. Often, individual hydrophone installation requirements contradict one an other and only an in-depth knowledge of the principles involved can aid in deciding which should be given priority.

General rules-of-thumb

Although individual vessel vary greatly with regard to physical construction and fishing methods, the following rules of thumb apply under most circumstances.

- Hydrophones should be located as far forward as possible, normally one-third the length of the water-line from the bow.
- If a vessel has a bow thruster, bubbles generated by its tunnel can block sensor signals. Hydrophones therefore should be either located forward of bow thrusters or far aft out of the stream of bubbles found behind them. Vessels equipped with bulbous bows can mount hydrophones in a specially designed shoe on the after part of the bulb, forward of the bow thruster.
- The minimum distance a hydrophone should be located from the main propeller is ten meters. Systems with hydrophones mounted closer than this will have reduced range due to underwater acoustic noise generated by propeller cavitation.
- For trawlers that do not have to take a pursing wire into consideration, hydrophones can be mounted in specially constructed blisters offset from the vessel's keel (preferably 1200 mm, but no less than 700 mm) to avoid turbulence. To

also aid in reducing the effects of turbulence, hydrophones should be installed as deeply as possible (preferably 600 mm, but not less than 400 mm) from the vessel's outer hull. When ever possible, the distance from the keel to the bottom of the hydrophone blister should not exceed 50 mm which can be adjusted by countersinking the installation.

- Keel installation of hydrophones is recommended for combined trawl/purse seining vessels that can not have blisters projecting from their hulls.

  On the starboard side of such vessels a purse seine hydrophone can be installed together with a trawl hydrophone.
- Hydrophones should have and unobstructed "view" of the sensors attached to the gear, but not be located in the line-of-sight of the main propeller.
- Hydrophones should be located aft of echo sounder transducers or sonar installations, preferable at a distance of two meters or more. A proximity of less than one meter should be avoided and hydrophones should never be subject to their direct (frontal) transmission.
- Objects protruding from the hull will generate noise, the areas aft of which should not be used to mount hydrophones.
- Thruster tunnels generate air bubbles which disrupt signals from the sensors. The areas aft of thruster tunnels or other sunken areas of the hull should not be used to mount hydrophones.
- If there is any doubt about the fore-and-aft positions for the hydrophones, they should be located at different distances from the bow (three to five meters relative to each other for a thirty-five meter vessel). The hydrophone that is closest the main propeller should be located on the port side of the vessel.
- Hydrophones have a *horizontal* coverage of approximately 50 degrees. To maximise coverage using two hydrophones they should be offset preferably 20 degrees outboard. With this configuration the two hydrophones will overlap each other by preferably 10 degrees and provide a total system coverage of 90 degrees.
- Hydrophones have a *vertical* coverage of approximately 30 degrees. The normal tilt angle is 20 degrees; if the system is to be used in deep water the hydrophones should be tilted preferably 30 degrees and in shallow water preferably 10 degrees. To maximise coverage using two hydrophones when

trawling in both deep and shallow water tilt one preferably 15 degrees and the other preferably 30 degrees. The hydrophone closes to the propeller should be tilted the most and care should be taken with regard to underwater acoustical noise.

- Hydrophone cables pass through a vessel's hull below its water-line. It is therefore strongly recommended that a length of conduit be fitted (using approve fastening procedures) to the interior of hull around the opening made for the hydrophone's cable. This conduit should extend vertically (inside the vessel) over the water-line so that hydrophone cables can be safely passed through the hull without the danger of flooding in the event of gland failure. Hydrophones with steel through-hull fittings installed in this manner can be replaced without the necessity of dry docking.
- The cable between the hydrophone and the cabinet must be properly shielded from other potential sources of electrical interference. A good practice is to run the hydrophone cable in a steel conduit to the wheel house.

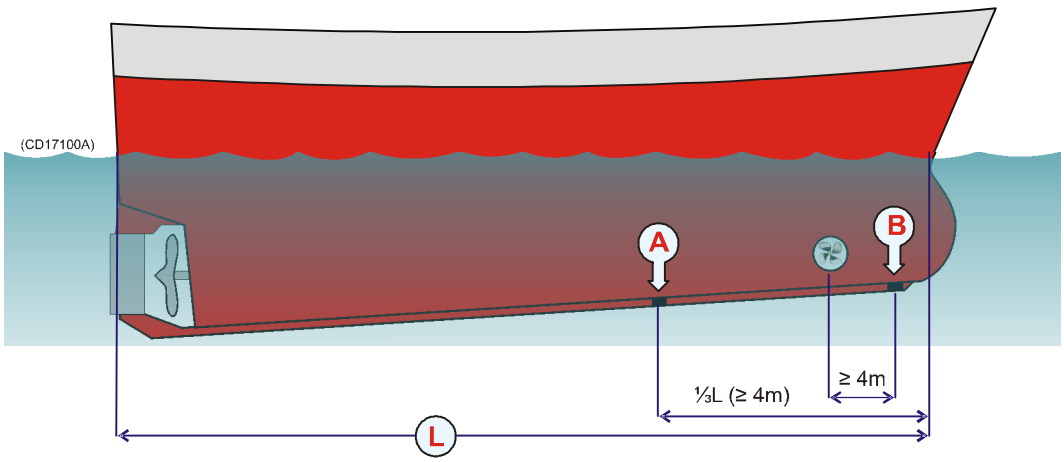


Figure 2 Recommended hydrophone locations

The illustration shows the recommended (A) and the alternative (B) locations for single hydrophone locations. For a dual installation, use position (A), and place the port hydrophone further aft than the starboard. (L) is the total length of the hull measured at the waterline.

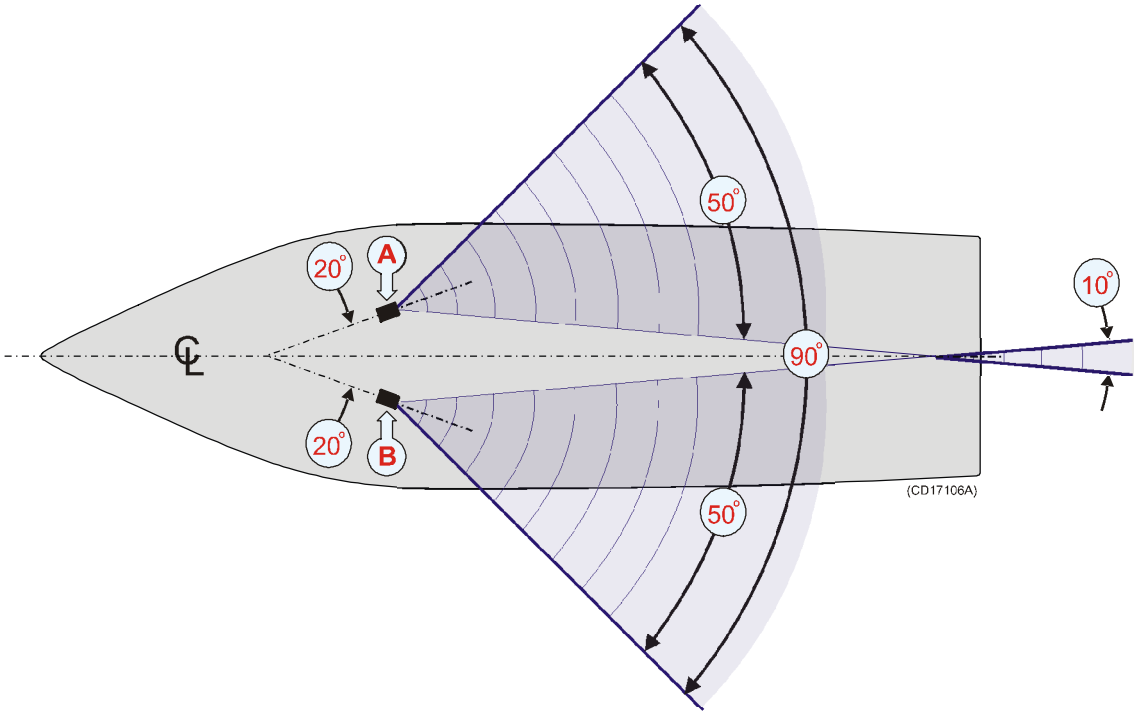
Coverage area, orientation and tilt

Once the fore-and-aft placement of the hydrophone is decided, it is equally important to carefully consider its horizontal and vertical orientation. Hydrophone orientation can have a large influence on system performance.

Hydrophones must be configured so that they overlap one an other in the horizontal plane. Tilt is decided by the actual depth of the gear. If fishing operations are to be conducted in both deep and shallow water the hydrophones can be tilted differently.

Horizontal coverage area

The hydrophone's beam sensitivity is concentrated within a 50 degrees horizontal and -30 degrees vertical sector. By off-setting hyprophones by 20 degrees each from the vessel's centre line an overlapping coverage area of 20 degrees is provided with a total coverage area of 90 degrees.



Horizontal coverage area

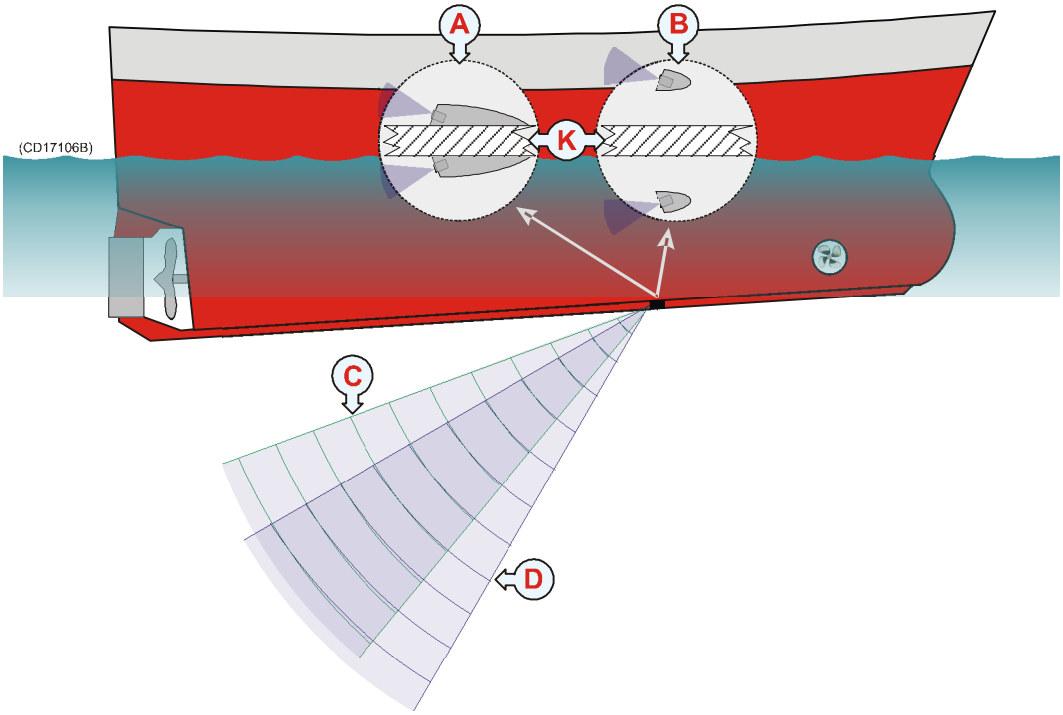
(A) = Starboard hydrophone

(B) = Port hydrophone

This "rule-of-thumb" is for normal trawling operations. For pair-trawling or when fishing with Danish seines, the horizontal position of the hydrophones should be configured with regard to the operation in question.

Vertical coverage area I

Dual hydrophone installation with hydrophones **equally distant** from the bow, but tilted differently.



Typical tilt configuration for operation in both deep and shallow water when the hydrophones have the same distance from bow. The hydrophones may be installed in shoes or blisters.

(A) = Using shoes (top view)

(B) = Using blisters (top view)

(C) = Port hydrophone tilted 10 to 20 degrees

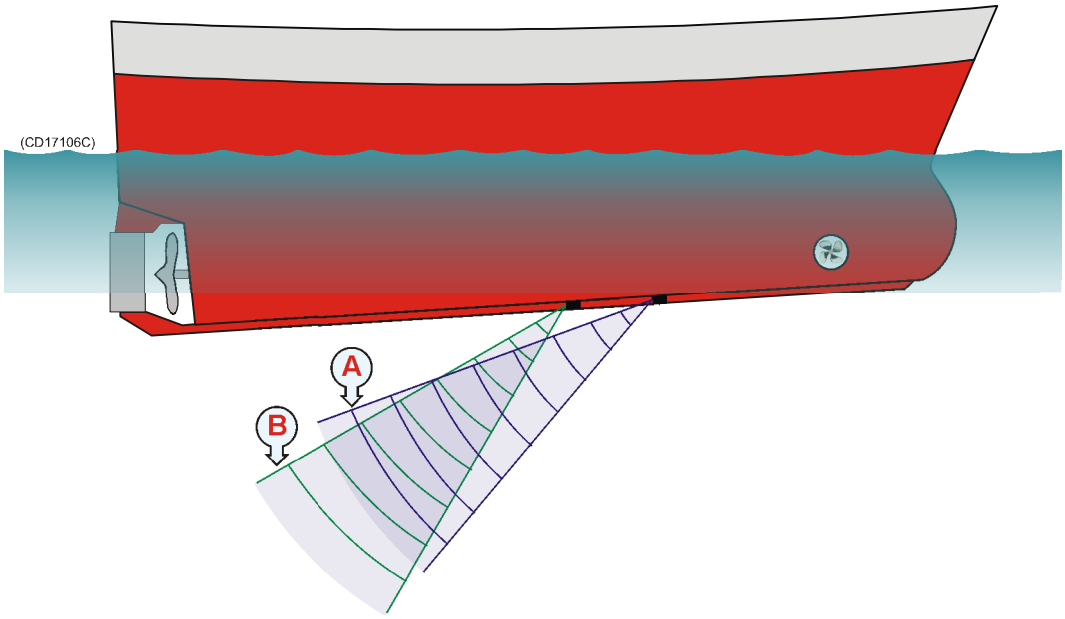
(D) = Starboard hydrophone tilted 20 to 35 degrees

(K) = Keel

The hydrophone on the starboard side of the hull should have the greater tilt of the two, approximately 20 to 35 degrees. The hydrophone on the port side of the hull should be tilted approximately 10 to 20 degrees

Vertical coverage area II

Dual hydrophone installation with hydrophones **different distances** from the bow, and tilted differently.



Typical tilt configuration for operation in both deep and shallow water when hydrophones have different distances from bow.

(A) = Port hydrophone tilted 20 to 35 degrees

(B) = Starboard hydrophone tilted 10 to 20 degrees

The hydrophone closest to the main propeller should be on the port side of the hull and have the greater tilt of the two, approximately 20 to 35 degrees. The hydrophone on the starboard side of the hull should be tilted approximately 10 to 20 degrees

Note: *The "tilt angle" is measures from the vessel's water-line toward the bottom when in operation. A vessel's hull and keel are normally not parallel with the water-line and/or the bow may lift when trawling. These factors must be noted and taken into consideration when deciding on the best possible hydrophone configuration for a given vessel. Refer to the theoretic penetration depth table for more information.*

Hydrophones have a vertical beam width of 30 degrees and should be tilted so with regard to optimizing system performance at the particular trawl depth in use. This configuration should be decided upon before hydrophone installation commences.

Simrad recommends that hydrophone tilt be preferably 20 degrees for normal trawling. If the vessel plans to operate in deep water the tilt can be increased to approximately 30 to 35 degrees or reduced to 10 degrees if trawling will be performed at or near the surface. Should a vessel need to operate in both deep and shallow waters two hydrophones be employed, each tilted preferably 15 and 30 degrees respectively.

Theoretic penetration depth table

Tilt	Distance in meters							
	250	**500**	**750**	**1000**	**1250**	**1500**	**1750**	**2000**
10 deg	50	100	150	175	225	250	300	350
15 deg	70	150	200	250	350	400	450	535
20 deg	90	180	275	350	450	550	650	750
25 deg	120	225	350	450	600	700	800	925
30 deg	150	300	450	575	700	850	1000	1150
35 deg	175	350	525	700	875	1050	1200	1400

Theoretic penetration depths for hydrophone beams

The table shows the theoretical penetration depths for hydrophone beams (measure from their centres) with regard to different tilt angles and varying distances to the sensors.

Recommendations:

- Normal trawling: approximately 20 degrees
- Deep sea trawling: 30 to 35 degrees
- Shallow water trawling: 10 to 15 degrees.

Mounting arrangement

The PI54 trawl hydrophones are delivered ready for installation in either freestanding or keel mounted shoes (which are to be built by the shipyard responsible for the installation). Several alternatives with corresponding detailed drawings have been included in this manual to cover the majority of installation options available. Information regarding through-hull penetration is also described to compliment the rules and regulations of the respective vessel's classification society.

For easy mounting and access a mounting flange is suggested. This is described in drawing 871-207229, and it has part number 599-207228.

Other well-founded information or previous experience with the installation of similar systems may also be evaluated even if not specifically described.

Referenced drawings

→ *PI54 Trawl hydrophone, outline dimensions, page 111*

→ *PI54 Trawl hydrophone, cut-out, page 112*

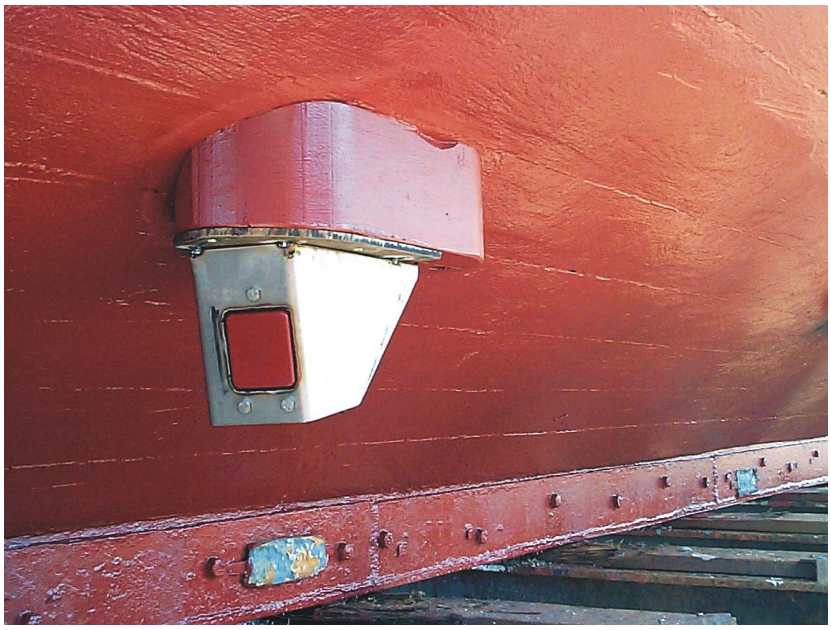
→ *PI54 Trawl hydrophone, mounting flange, page 114*

→ *Free standing hydrophone in blister, page 116*

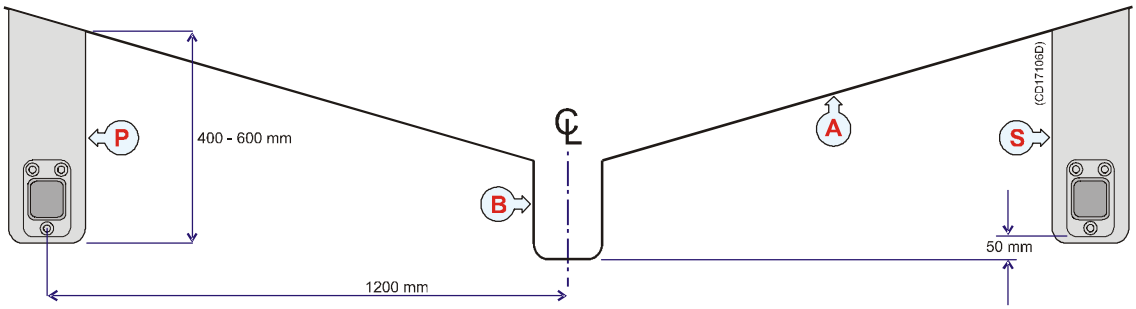
→ *Hydrophone in keel mounted shoes, page 118*

Freestanding hydrophones in blisters

For trawlers that do not have to take a pursing wire into consideration, hydrophones can be mounted in specially constructed blisters offset from the vessel's keel (preferably 1200 mm, but no less than 700 mm) to avoid turbulence.



The picture shows an example of a freestanding hydrophone offset from the keel on a wooden vessel.



Approximate blister location, view from stern. All measurements are approximate, and the drawing is not in scale.

(A) = Outer hull

(B) = Keel

(P) = Port hydrophone blister

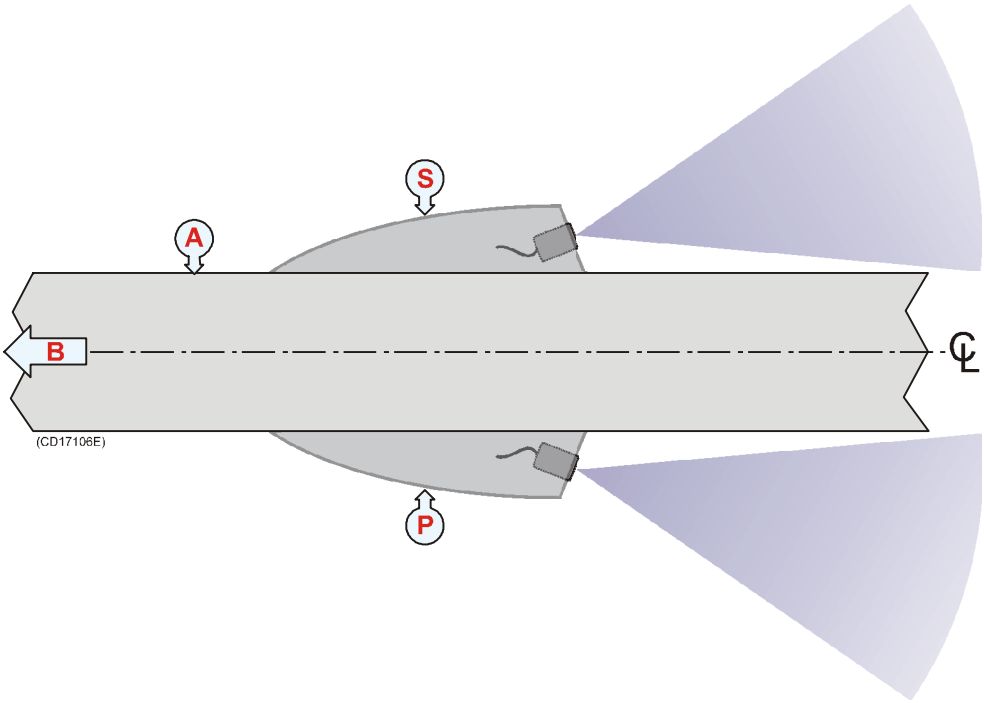
(S) = Starboard hydrophone blister

The farther away from the hull a hydrophone is mounted the more the effects of turbulence are reduced. Simrad recommends that hydrophones be installed as deeply as possible (preferably 600 mm, but not less than 400 mm) from the vessel’s outer hull. When ever possible, the distance from the keel to the bottom of the hydrophone blister should not exceed 50 mm.

The section regarding hydrophone coverage including horizontal orientation and tilt also applies to hydrophones mounted in blisters.

Keel mounted shoes

Hydrophones can be keel mounted to avoid creating appendages to the hull that could foul the purse wire.



Keel mounted hydrophone shoes, top view.

(A) = Keel

(B) = Towards the bow

(S) = Starboard shoe with hydrophone

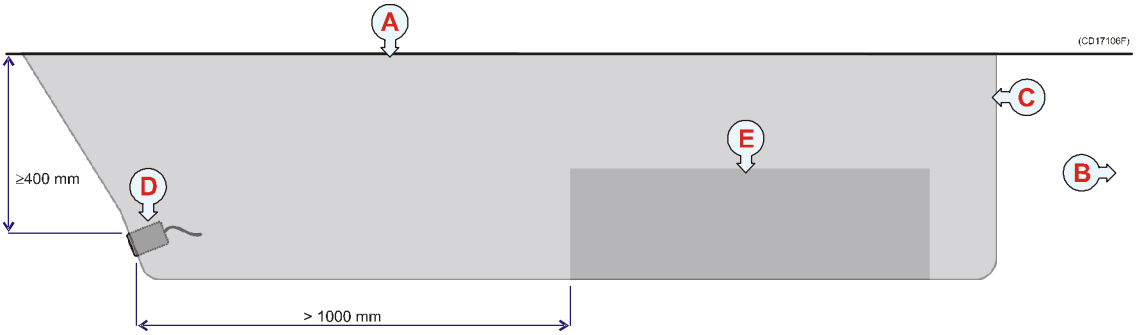
(P) = Port show with hydrophone

Should this solution be chosen, the following must be taken into consideration:

- Hydrophones must have an unobstructed line-of-sight to the sensors attached to the trawl.
- Hydrophones should be trained 20 degrees to either side of the vessel's centre line providing a 10 degree overlap and a horizontal coverage area of 90 degrees.
- Hydrophones should be mounted as deeply as possible on the hull, but not so deep that they may be damaged when docking the vessel.
- For combined purse seine and trawl applications a seine hydrophone may be mounted in the starboard (or port) blister/shoe along with the trawl hydrophone.

Mounting at the aft end of a shoe

Hydrophones can be mounted at the after end of a transducer shoe for an echo sounder or other underwater acoustic equipment. The distance between the hydrophone and such equipment must not be less than one meter and the greater the separation, the better. Installing a hydrophone in close proximity to underwater acoustic equipment can reduce system performance due to interference.



Hydrophone mounted at the aft end of a echo sounder transducer shoe. The drawing is shown from the side, and it is not to scale.

(A) = Outer hull.

(B) = Towards the bow

(C) = Fairing

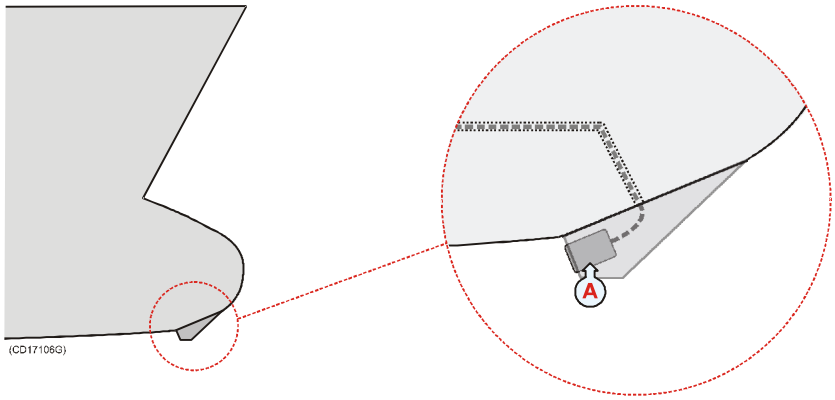
(D) = Hydrophone

(E) = Area allocated for echo sounder transducer(s)

The illustration shows a PI54 hydrophone installed aft of an echo sounder arrangement for one or more transducers and/or other underwater acoustic equipment. Note the minimum allowable distance between the PI54 hydrophone and the other equipment. As with other mounting options, hydrophones mounted at the after end of a transducer shoe must have an unobstructed line-of-sight to the sensors attached to the trawl.

Mounting at the after end of a bulbous bow

Trawling hydrophones have been successfully installed at the after end of bulbous bows (for vessels trawling in deep water and require tilt angles from 25 to 35 degrees). Vessels equipped in this manner may experience signal loss in heavy weather due to bubbles or when pounding lifts the hydrophone out of the water. Normally these types of interruptions are short and sensor signals can be again received once the hydrophone(s) is immersed.



Mounting the hydrophone (A) at the after end of a bulbous bow.

Hydrophones installed at the after end of bulbous bows should be tilted and oriented horizontally as explained in the corresponding sections of this manual. It is recommended that other underwater acoustic equipment not be installed together with the hydrophone(s).

Dual hydrophone installation

The PI54 system trawl hydrophones receive horizontally and vertically within 50 and 30 degree sectors respectively. Signals transmitted from sensors attached to towed gear must be able to be received on both sides of a vessel's keel under normal operating conditions. When a single hydrophone is installed, it must therefore be mounted no more than five centimetres higher than the lowest point on the keel to ensure proper coverage on both sides of the vessel. Hydrophones that protrude from the hull in this manner are often subject to damage when for example dry-docking and special precautions should be taken to safeguard their protection.

Simrad recommends the use of two hydrophones to ensure the necessary horizontal and vertical coverage for proper system operation. This also allow the respective coverage areas of the hydrophones located on opposite sides of the hull to overlap each other providing the system with the ability to be optimized for a specific type and method of fishing. The use of dual hydrophones have the following benefits:

- They provide a larger area of coverage with the ability to receive signals even when the trawl is being substantially set.
- The hydrophone on the lee side of the vessel can provide better signals in heavy weather.
- Hydrophone placement can be optimized without having to take into account signal clearance over the vessel's keel.
- Each hydrophone can be placed at a different distance from the bow if there is any doubt about which configuration is best.
- The hyprophones can be tilted individually to optimise performance when trawling in deep or shallow water and to provide wider overall coverage.

Hydrophone protection

Warning: ***Do not perform hot work near, paint, scrape, hit, pry, force, sandblast, high-pressure wash or otherwise subject hydrophones to excessive force.***

Installation precautions

The following precautions must be observed. Failure to do so can result in damage to the trawl hydrophone which may render the PI54 system inoperative.

1 Do not install the hydrophone until all hot work is complete!

2 Do not over-tighten the packing nipple as this could damage the hydrophone's cable!

3 Observe the maximum allowable torque warning of 5 Nm when tightening hydrophone studs!

4 Use only stainless steel M8x35 socket countersunk head screws for mounting the hydrophone!

5 Secure threaded hydrophone hardware with Loctite™ 270 or the equivalent!

6 The PI54 cabinet should always be connected to the ship's ground to reduce the effects of electrical interference on the system!

Under installation

Hydrophones must not be installed until all structural work, specifically welding sandblasting and other potentially harmful operations are completed. If hot work, sandblasting, spay painting or water blasting is to be performed in the vicinity of a hydrophone it must be properly protected. PI54 hydrophones although very rugged, contain sensitive ceramic elements and electronic circuits and therefore should never be struck, prided, clamped or subject to other types of potentially damaging force as for example over-tightening mounting hardware.

Deflection plates

Simrad recommends that hydrophones mounted in blisters be protected by rope deflections plates both forward and aft. Such precautions will help protect the hydrophones, especially in the event the vessel passes over a wire, line or net.

Vessels operation in colder climates should weld steel fins and protection plates installed around hydrophones to protect them from being damaged by ice. Detailed drawing must be made specifically to suite each individual vessel in question and the installation performed by an authority with the expertise to do so.

Surface protection

Maintenance and replacement costs can be reduced if those parts of the hydrophone installation that are open to the sea are protected correctly. Any new metal or original plating involved in the hydrophone installation which has been cut, sand-blasted, welded or otherwise had its protective coating compromised must be thoroughly cleaned and repainted. For steel vessels use polyester primer, undercoat and top-coat according to the manufacture's instructions, then apply the same anti-fouling paint used on the rest of the hull.

Hydrophone face

This is Simrad's list of approved antifouling paints for hydrophone faces.

From Jotun Paints, Sandefjord Norway:

- Antifouling Seamate HB 33, HB 66 and HB 99
- Racing
- Non-stop

From International Paints:

- Intersleek tie coat + 425 FCS
  - BXA386/BXA390/BXA391 Grey
  - HKA563/HKA570/HKA571 Yellow

Mix BXA386, BXA390 and BXA391 first, then apply. When dry, mix HKA563, HKA570 and HKA571, apply.

From Hempel IFA Coatings AS:

- Hempel A/F Classic 76550

From Jotun-Henry Clark Ltd:

- Anti-fouling Seaguardian

From **International Marine Coatings**:

- Intersmooth 360 Ecoloflex SPC
- Micron Ekstra

Note: *Refer to the manufacturer's documentation and data sheets for a complete procedure.*

Location and marking

After installation, the location of hydrophones should be clearly marked on the vessel's hull (above the water-line) directly over them. This information will help prevent hydrophone damage when dry-docking the vessel. It is very important to amend the docking-plans of larger vessels to also reflect this information so that blocks will not be placed in the vicinity of hydrophones, fins, deflection plates or other associated appendages.

After installation / Sea trials

Once the installation is complete and the vessel afloat, the system's performance should be documented. Refer to the appropriate section in the PI54 Operation manual regarding the measurement of a noise vs. speed curve.

Hydrophone cable

The trawl hydrophone is delivered with a 22 m cable. The cable is fitted with plug that fits the ANT socket on the rear side of the PI54 Operator Unit. The standard hydrophone delivery includes cable gland kit 599-202216 for steel hulls, and the hydrophone cable has been cut to allow this cable gland to be installed.

General cable gland guidelines

Hydrophone cables are passed through the hull using approved cable glands for the type of vessel in question. The standard delivery consists of a **steel** cable gland that is to be welded to the hull.

A **bronze** cable gland can be delivered as an option for vessels with wood or fibreglass construction. Vessel not to be classified can as an option use a cable gland made of **plastic**.

Note: *Simrad strongly recommends that a length of conduit be fitted around hydrophone cable glands made of steel or bronze and extended over the water-line inside the vessel. This precaution reduces the danger of flooding in the event of gland failure and hydrophones installed in this manner are also easier to replace.*

Some vessels may experience difficulties finding suitable areas of the hull for mounting hydrophone cable glands due to existing water tanks, concrete ballast or other obstacles. A possible solution in such cases is to run the hydrophone cables in a steel conduit aft along the hull until a suitable cable gland location is available. The respective cable gland can then be installed as described in the following instructions.

Note: *Simrad takes no responsibility for the correct installation of cable glands, associated hull modifications and/or structural support of hydrophone cable penetration. These activities are subject to individual approval by the respective classification society for the vessel in question.*

Order numbers

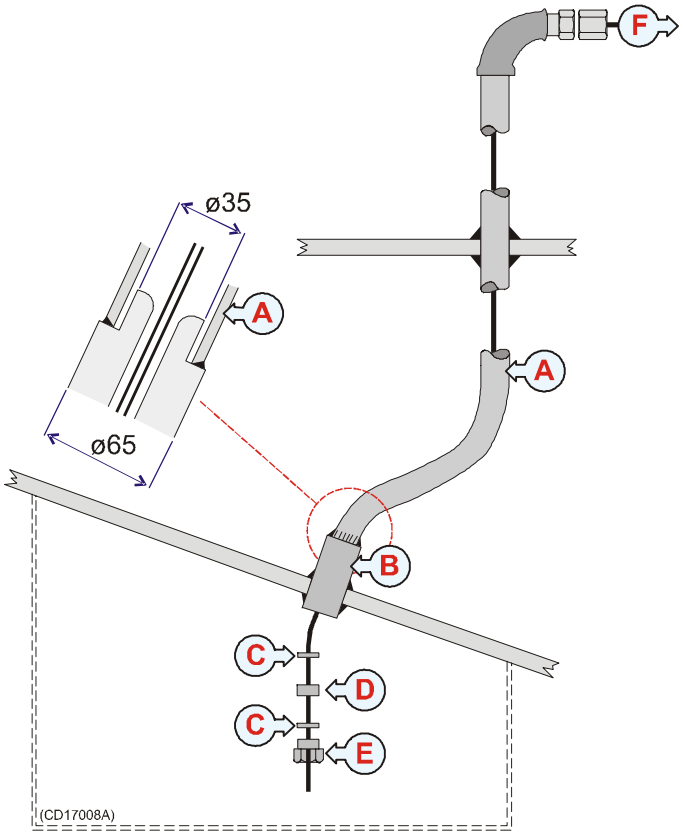
Steel hull cable gland kit: 599-202216

Wood/GRP hull cable gland kit: 119-038200

Small vessel cable gland kit: 599-202182

Cable gland installation for steel hulls

The cable gland kit for steel vessels is included with standard deliveries. The drawing shows a single hydrophone, but normally a typical installation includes two hydrophones with respective cables spliced in a junction box and run to the wheelhouse in a conduit.



Cable gland for steel hull vessels.

(A) = Steel conduit

(B) = Stuffing tube, DNV approved carbon steel st52.3

(C) = Washers, 24 x 8 x 2 mm

(D) = Rubber gasket

(E) = Packing nipple. Make sure that you do not damage the hydrophone cable by tightening the packing nipple too hard!

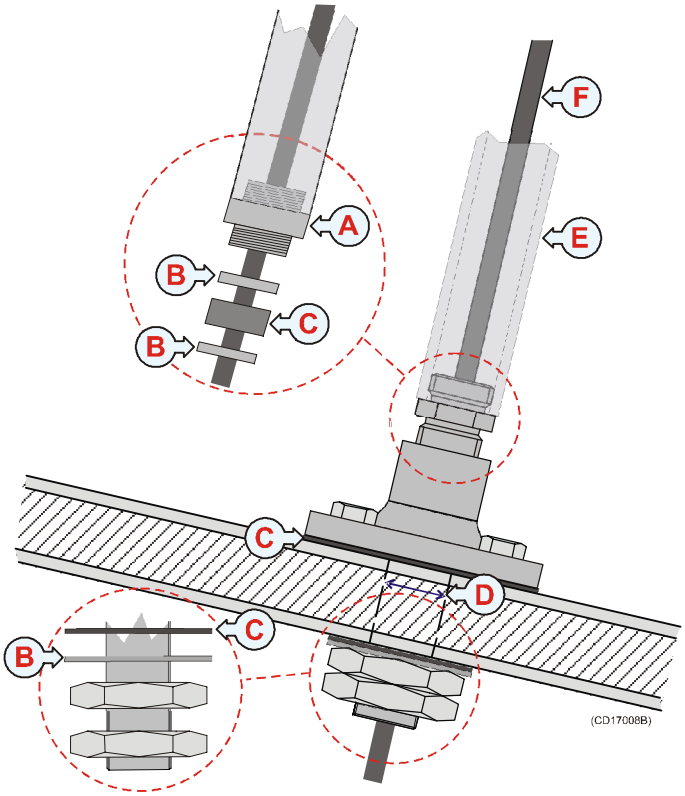
(F) = Cable to the PI Operator unit (or a junction box)

The gland gland kit includes all of the necessary parts needed to install the unit excluding screws.

Gland installation for wood or GRP hulled vessels

A bronze cable gland kit is available for wood and GRP vessels. This kit is not included in the standard delivery, and must be ordered separately.

The drawing shows a single hydrophone, but normally a typical installation includes two hydrophones with respective cables spliced in a junction box and run to the wheelhouse in a conduit.



Cable gland for wood and GRP hulls.

(A) = Packing nipple. Make sure that you do not damage the hydrophone cable by tightening the packing nipple too hard!

(B) = Washers

(C) = Rubber gaskets

(D) = Hole diameter 28 mm

(E) = Steel conduit

(F) = Hydrophone cable

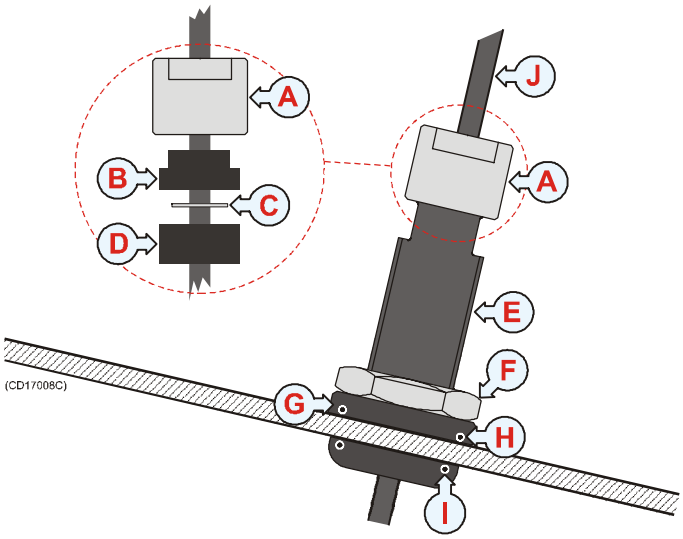
The gland gland kit includes all of the necessary parts needed to install the unit excluding screws.

Simrad recommends that a one inch conduit (that the hydrophone cable will be run through) with an inside threaded diameter of three-quarter inches be attached to the gland's packing nipple. This connection must be watertight, and the conduit must extend to over the vessel's water line and terminated as described for steel hulled vessels.

Cable gland installation for smaller vessels

Cable glands made of plastic for those smaller vessels that do njot need to be classified are optional equipment for standard deliveries. This cable gland kit is not included in the standard delivery, and must be ordered separately.

The drawing shows a single hydrophone, but normally a typical installation includes two hydrophones with respective cables spliced in a junction box and run to the wheelhouse in a conduit.



Hydrophone cable gland for small vessels.

(A) = Packing nut (bronze). Ensure that you do not to damage the hydrophone cable by tightening the packing nut too hard!

(B) = Rubber gasket

(C) = Plastic disk

(D) = Rubber gasket

(E) = Stuffing tube

(F) = Backing nut (bronze)

(G) = Backing washer (plastic)

(H) = O-ring 42.5 x 3.0 N

(I) = O-ring 39.5 x 3.0 N

(J) = Hydrophone cable

Stuffing tube hole diameter: 36 mm ±1.5 mm.

Apply ample amount of sealant between the backing washer (H) and the hull plate.

The cable gland kit contains all the listed parts, except the sealant.

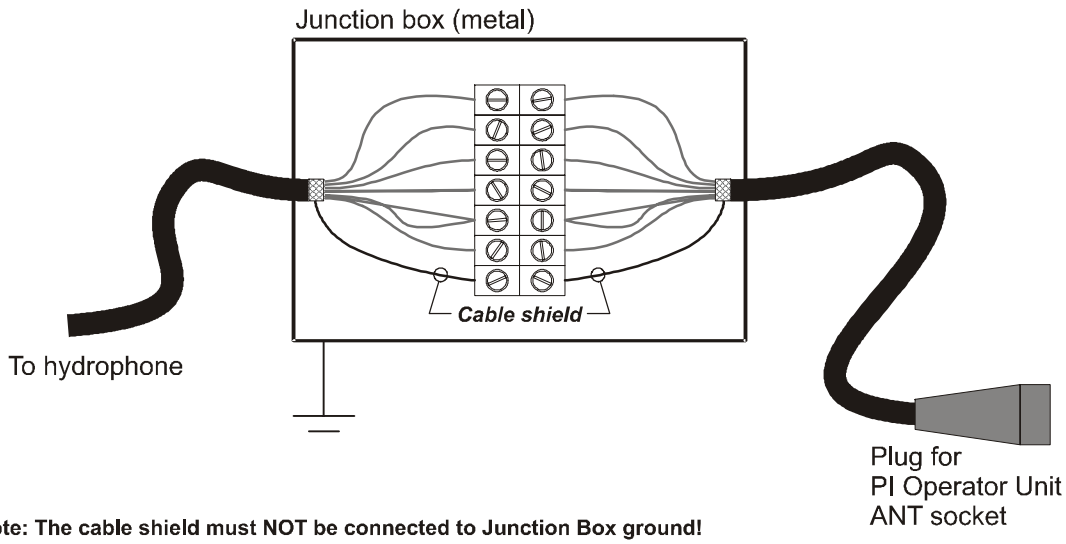
Note: *The two O-rings must be clean, in good condition and free of cuts or other defects which could affect their water-tight integrity.*

Splicing

If you need to cut the cable, you must splice it correctly.

Note: *DO NOT solder the wires together with only electrical tape for insulation, as this will result in electrical noise and reduced operational performance.*

To splice the cable, use a metal junction box. The chassis of the junction box must be grounded, but the cable shielding must NOT be connected to the junction box ground.



W813A / Rev.A	PI Hydrophone cable with Junction box

Note: *Make sure that you connect the cables 1:1! The red cable in the "input" cable MUST be connected to the red cable in the "output" cable etc.*

Cable specification

If extension cables are used, these must be supplied by the installation shipyard. The following specifications must be regarded as a minimum:

2 x 2 x 0.5 mm^2 / Twisted pairs / Overall braided

Observe the information regarding cable splicing.

Grounding and shielding

Cable shielding must be continuous. The shielding is terminated in the cabinet and must not be grounded in the junction boxes.

In order to minimize electrical interference, Simrad strongly recommends that the hydrophone cable is installed in a metal conduit between the hydrophone and the PI54 cabinet.

Installation drawings

Observe the following drawings. The drawings are also available on electronic format (DWG or PDF), consult your local dealer.

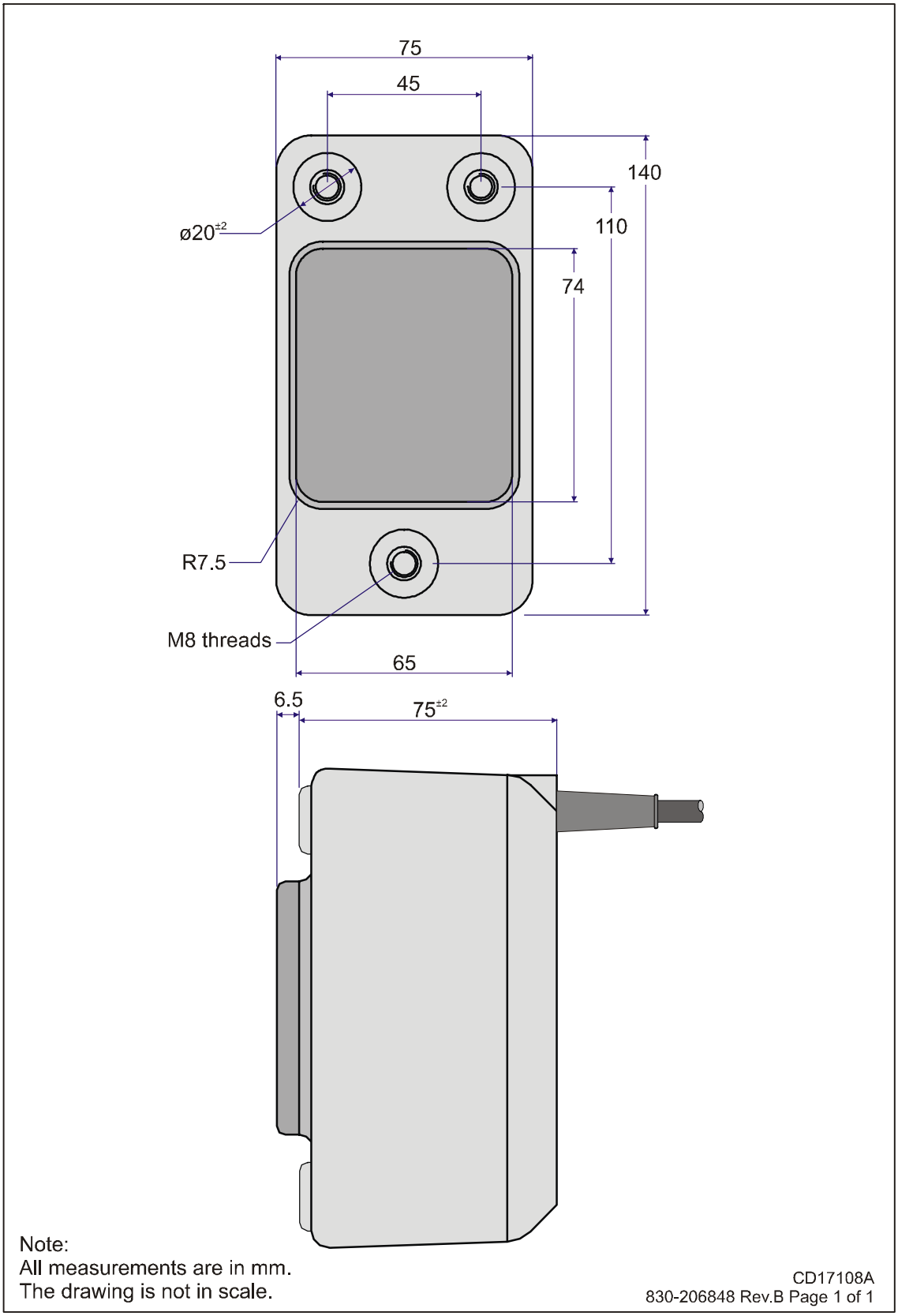
→ *PI54 Trawl hydrophone, outline dimensions, page 111*

→ *PI54 Trawl hydrophone, cut-out, page 112*

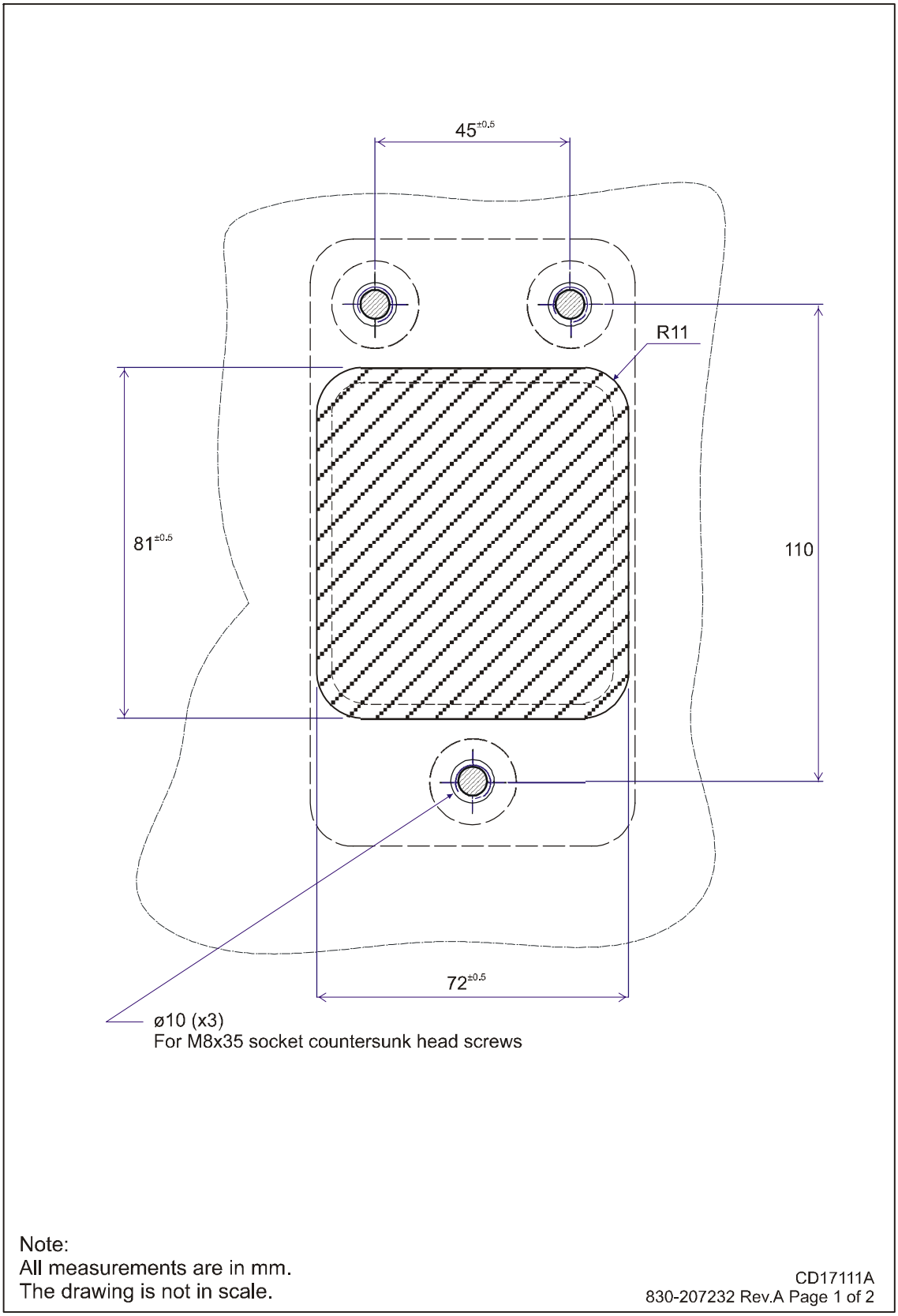
→ *PI54 Trawl hydrophone, mounting flange, page 114*

→ *Free standing hydrophone in blister, page 116*

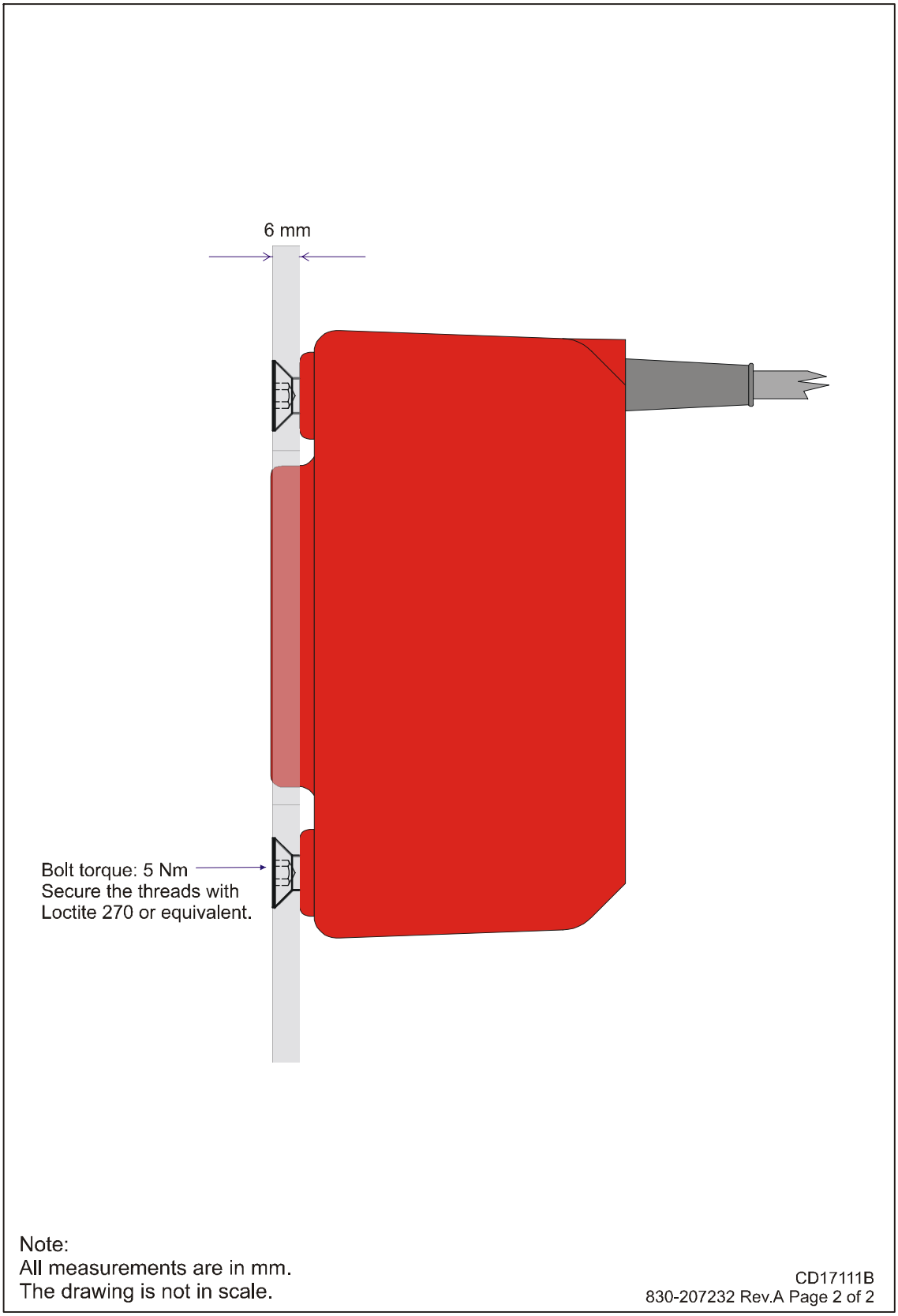
→ *Hydrophone in keel mounted shoes, page 118*



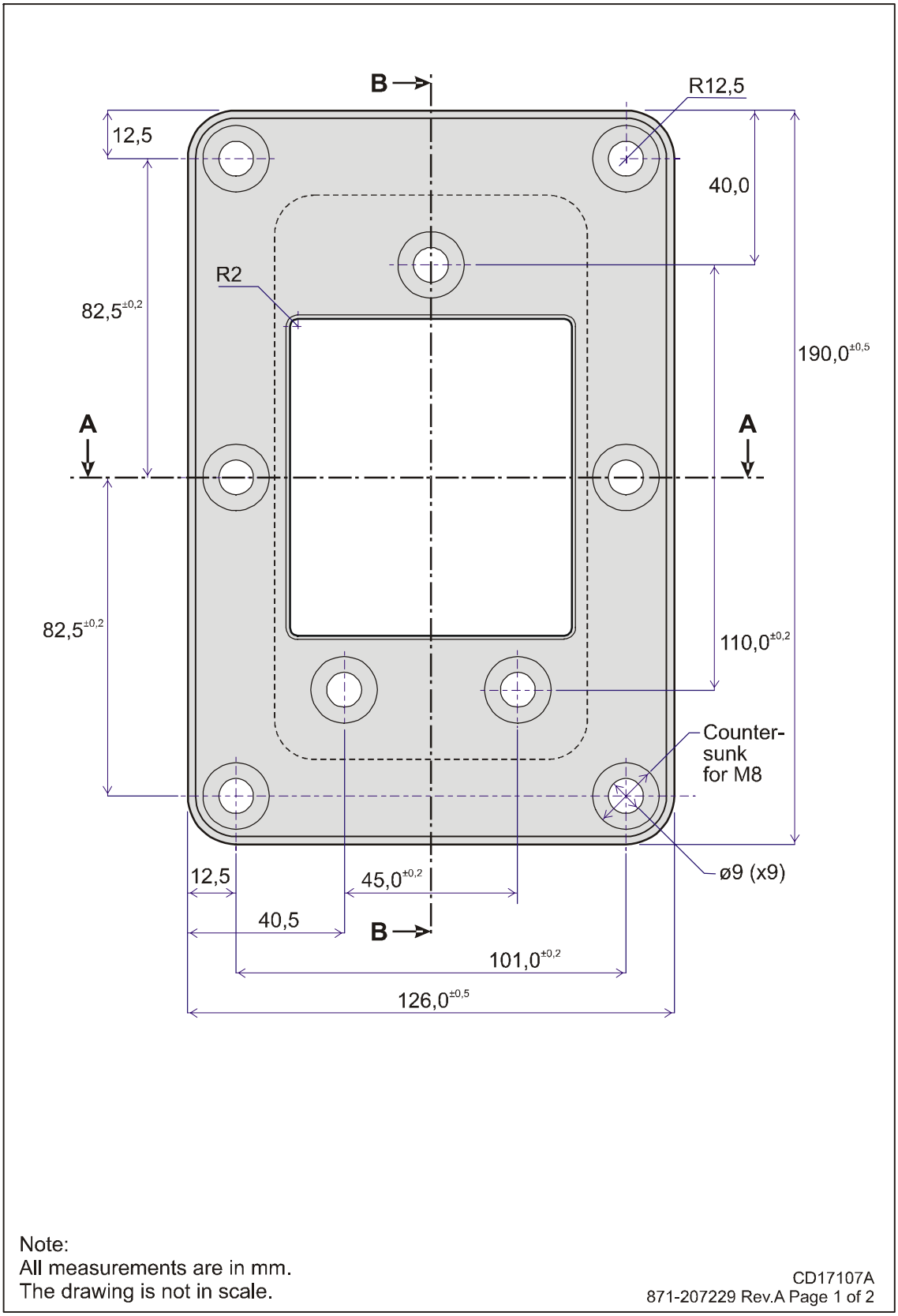
PI54 Trawl hydrophone - Outline dimensions



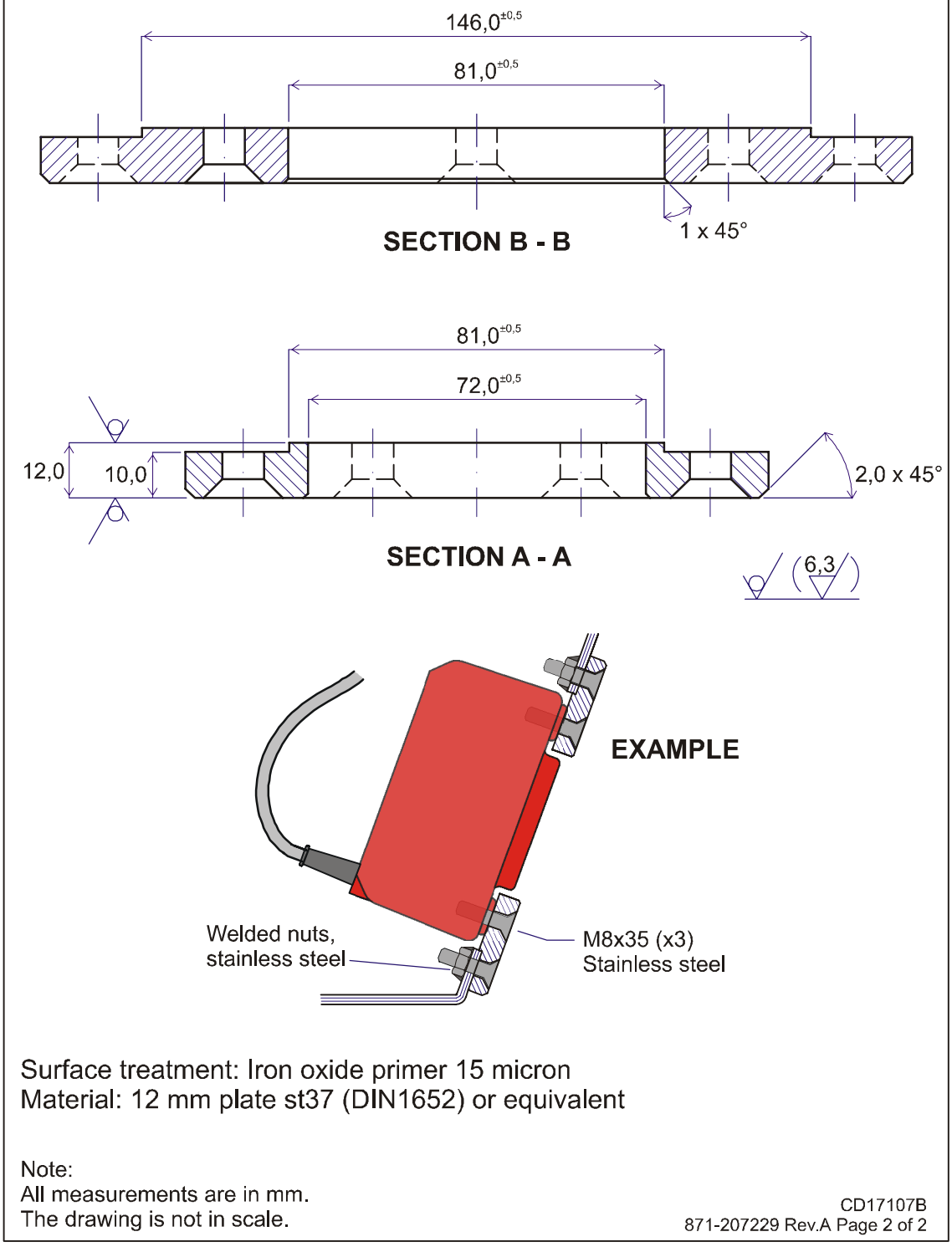
PI54 Trawl hydrophone - Cut-out - Page 1



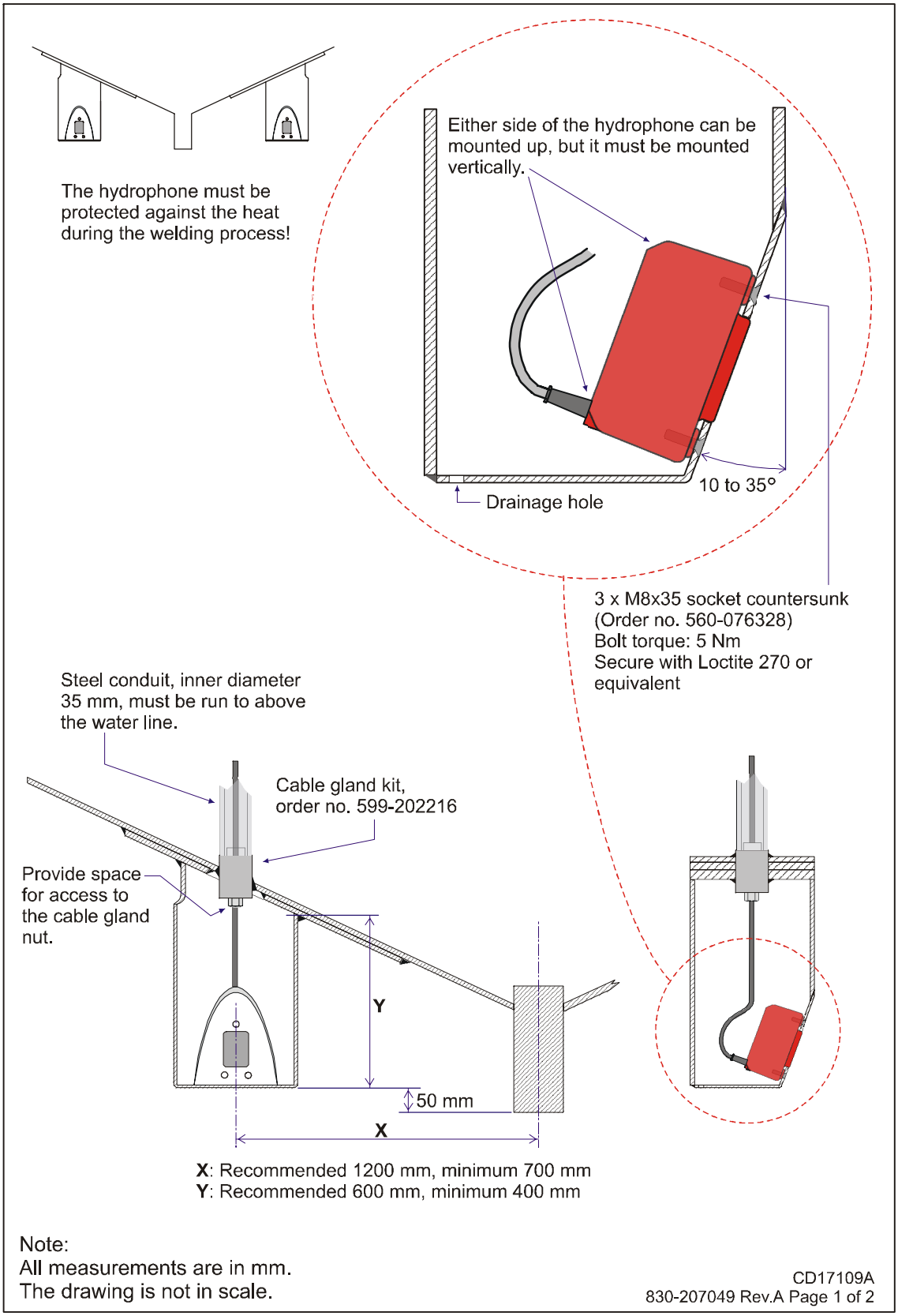
PI54 Trawl hydrophone - Cut-out - Page 2



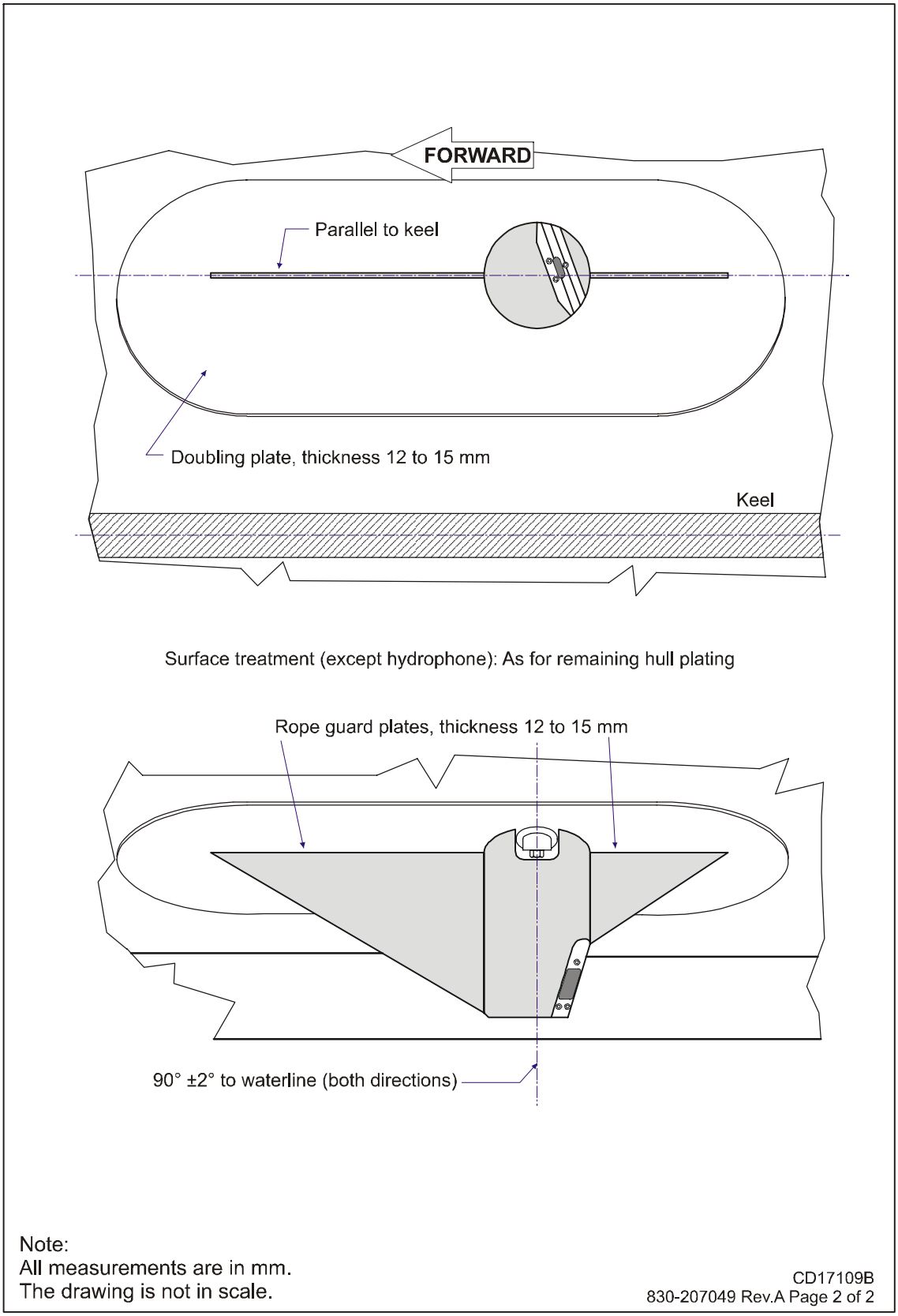
PI54 Trawl hydrophone - Mounting flange - Page 1



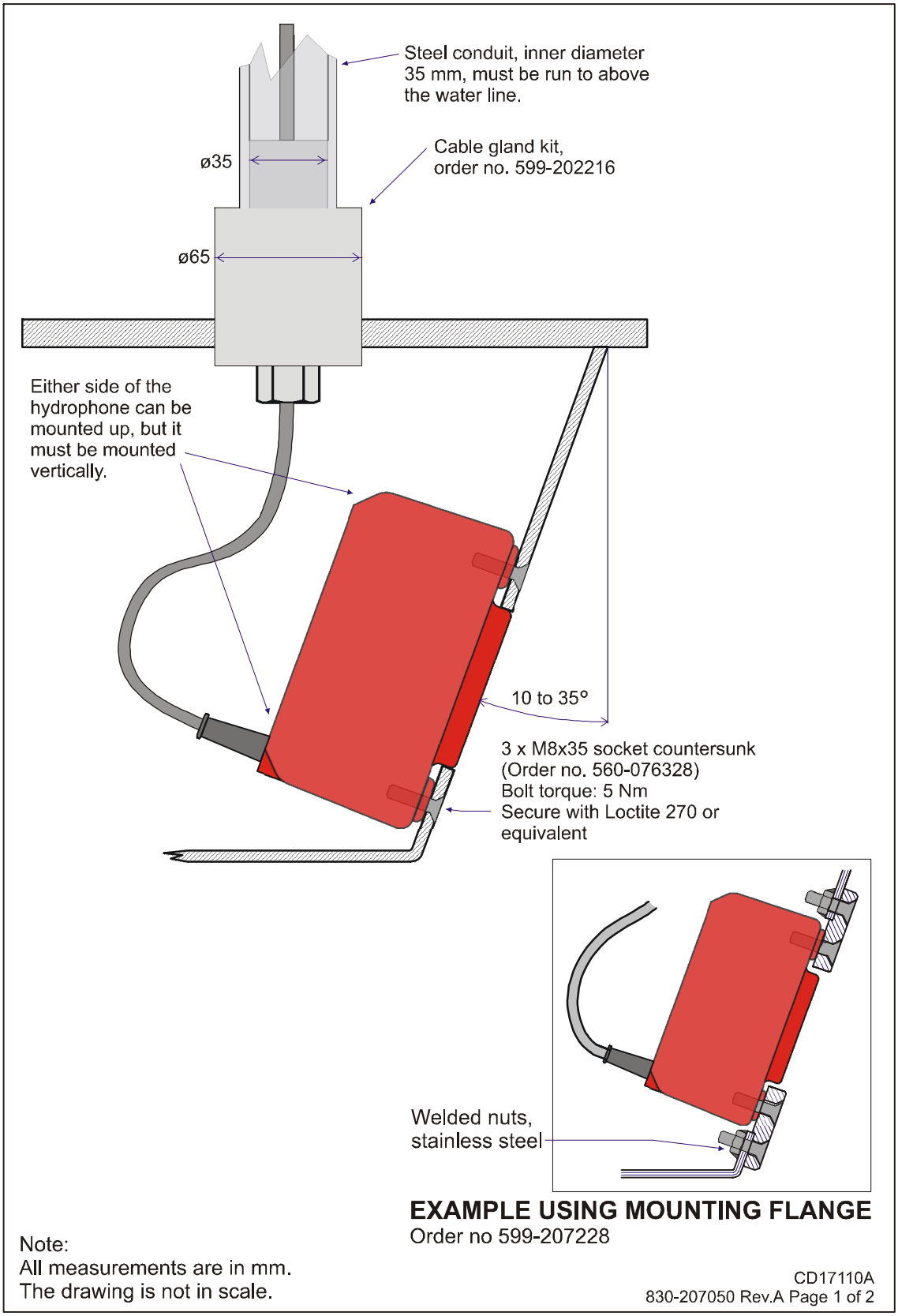
PI54 Trawl hydrophone - Mounting flange - Page 2


The hydrophone must be protected against the heat during the welding process!
Either side of the hydrophone can be mounted up, but it must be mounted vertically.
10 to 35°
Drainage hole
3 x M8x35 socket countersunk
(Order no. 560-076328)
Bolt torque: 5 Nm
Secure with Loctite 270 or equivalent
Steel conduit, inner diameter 35 mm, must be run to above the water line.
Cable gland kit, order no. 599-202216
Provide space for access to the cable gland nut.
Y
50 mm
X
X: Recommended 1200 mm, minimum 700 mm
Y: Recommended 600 mm, minimum 400 mm
Note:
All measurements are in mm.
The drawing is not in scale.
CD17109A
830-207049 Rev.A Page 1 of 2

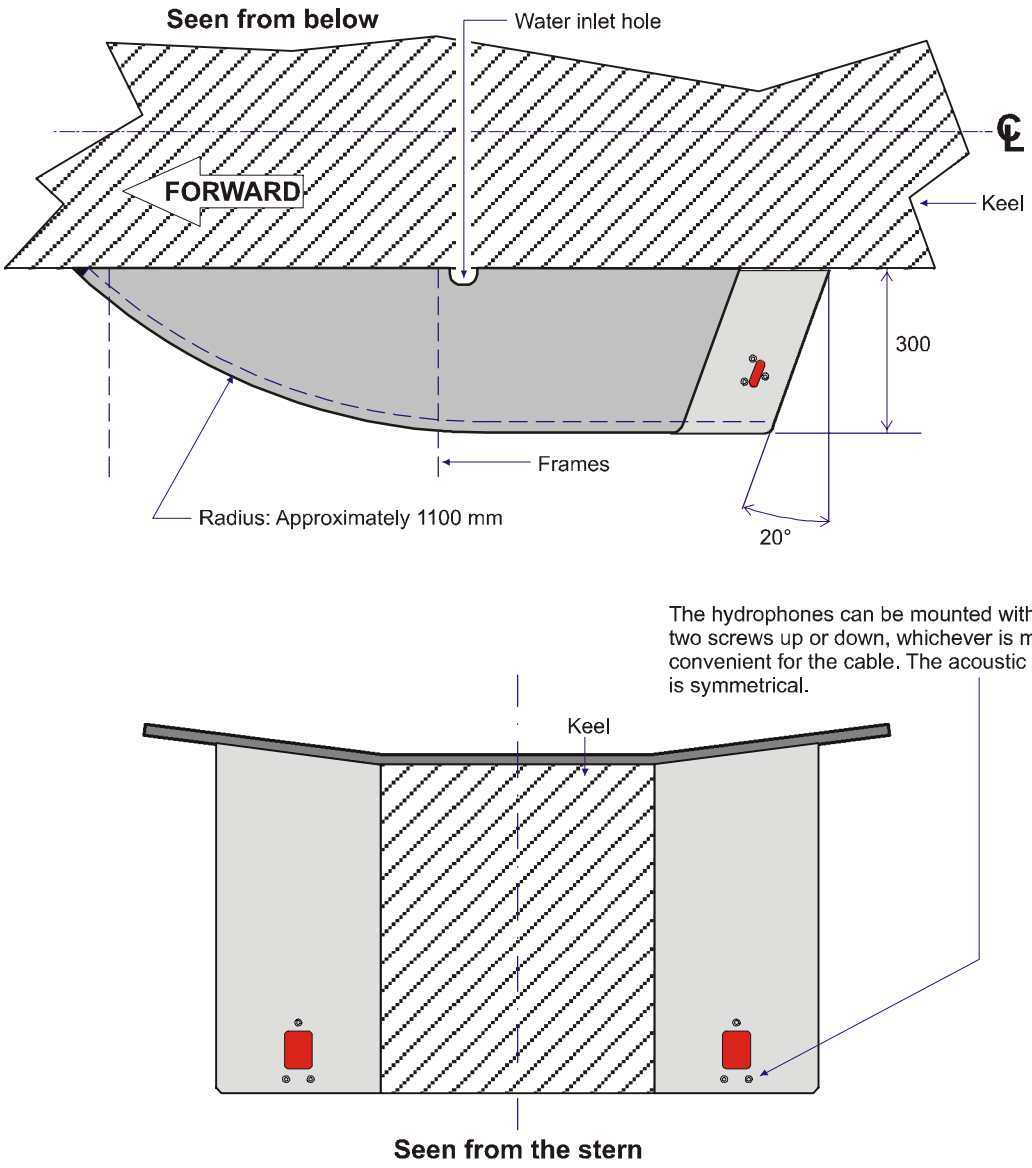
PI54 Trawl hydrophone in blister - Arrangement drawing - Page 1


FORWARD
Parallel to keel
Doubling plate, thickness 12 to 15 mm
Keel
Surface treatment (except hydrophone): As for remaining hull plating
Rope guard plates, thickness 12 to 15 mm
90° ±2° to waterline (both directions)
Note:
All measurements are in mm.
The drawing is not in scale.
CD17109B
830-207049 Rev.A Page 2 of 2

PI54 Trawl hydrophone in blister - Arrangement drawing - Page 2



PI54 Trawl hydrophone in keel mounted shoes - Arrangement drawing - Page 1


Seen from below
Water inlet hole
FORWARD
Keel
300
Frames
Radius: Approximately 1100 mm
20°
The hydrophones can be mounted with the two screws up or down, whichever is most convenient for the cable. The acoustic beam is symmetrical.
Keel
Seen from the stern

Note:
All measurements are in mm.
The drawing is not in scale.

CD17110B
830-207050 Rev.A Page 2 of 2

PI54 Trawl hydrophone in keel mounted shoes - Arrangement drawing - Page 2

5 PORTABLE HYDROPHONE

Purpose

The purpose of this chapter is to provide general guidelines for the installation of the PI54 portable hydrophone.

The PI54 portable hydrophone has been developed as a temporary measure until a fixed hydrophone can be installed at the vessel's next dry docking.

The portable hydrophone's cable is 50 meters long and sheathed in polyurethane providing robust external protection to compliment its 150 kg tensile strength. This combination towing/hydrophone cable is wound on a small (hand operated) drum which is connected to an additional 10 meter lenght of hydrophone cable with an integrated seven pin plug for connection to the PI54 cabinet.

Order numbers

Portable hydrophone, complete; HYD-202713

Portable hydrophone, paravane arrangement kit: KIT-207284

Topics

→ *General guidelines, page 121*

→ *Deployment over the side, page 122*

→ *Paravane arrangement, page 123*

→ *Storage, page 126*

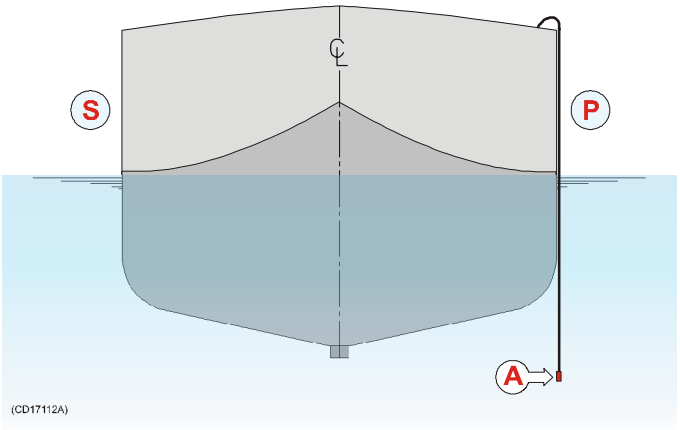
General guidelines

The following must be taken into consideration when using portable hydrophones:

- Sharp edges that could damage the hydrophone cable insulation must be avoided.
- Do step on cable lying on deck.
- Do not place any objects (light or heavy) on top of cable lying on the deck.
- The hydrophone cable must not be knotted, and kinking must be avoided.
- When used, the hydrophone should be lowered deeper than the vessel’s keel.
- Special care must be taken so that the hydrophone an/or cable do not become fouled in the main propeller, thrusters or gear.

Deployment over the side

Unlike permanently mounted hydrophones, the portable hydrophone has an omni-directional beam. It can therefore be lowered below the level of high underwater noise and air bubbles generated by the main propeller and bow/sternthrusters which can block reception of hull mounted units.



(A) = Portable hydrophone

(P) = Port

(S) = Starboard

When the seine is normally located forward of the starboard beam when pursing the following information should be taken into consideration:

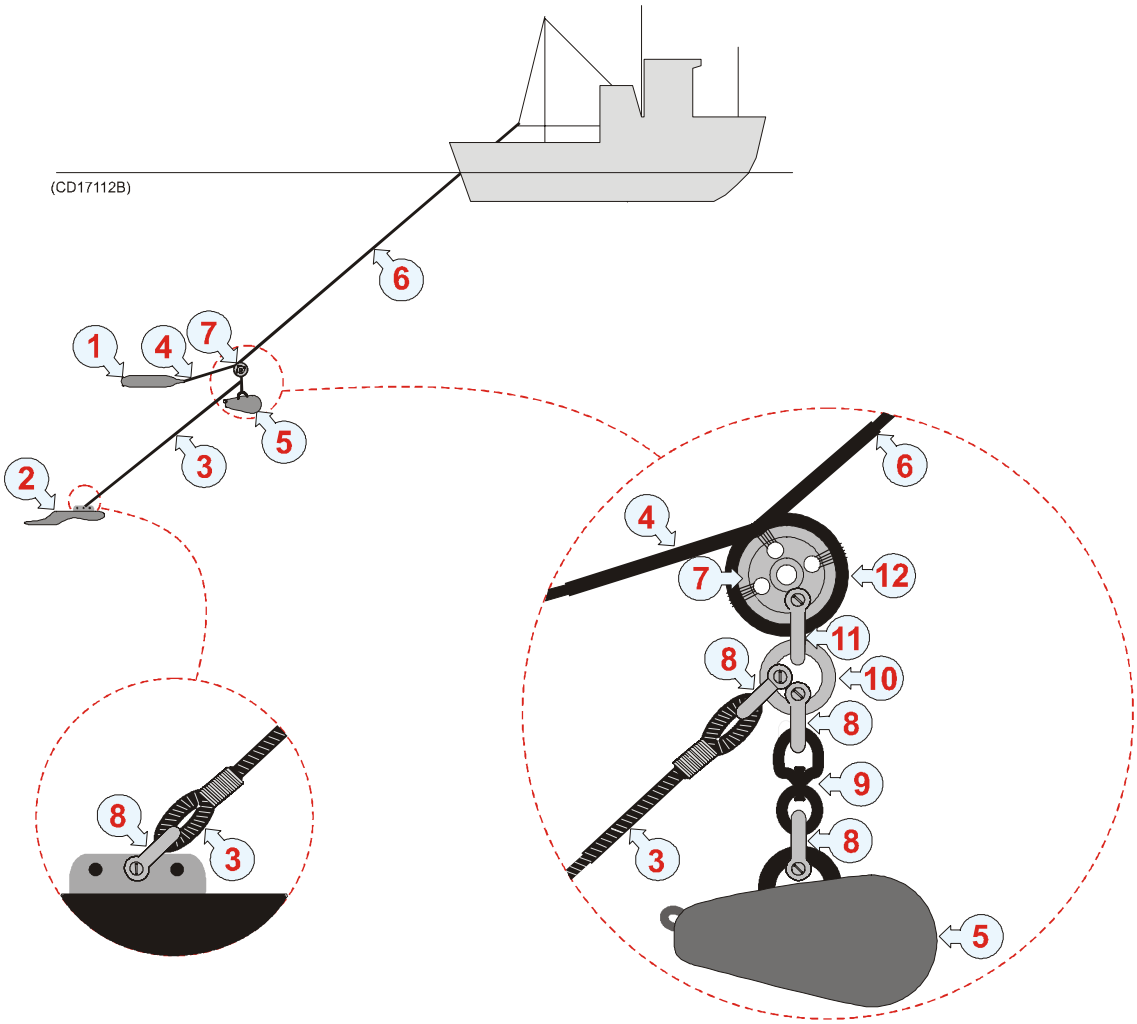
- The portable hydrophone is to be deployed over the port side of the vessel, midships, as far away from bow or stern thruster(s) used when pursing as possible.
- Note that the portable hydrophone's location is opposite to that of a permanently mounted unit. When pursing to **starboard** the hydrophone is normally lowered over on the **port** side of the vessel.
- The hydrophone cable should be made fast to the vessel's bulwarks.

Paravane arrangement

The portable hydrophone available with the PI54 system has a broad coverage area. For this reason, its orientation with regard to the sensors is not that critical.

The hydrophone weighs approximately 700 grams (in salt water) and can be mounted on a towed paravane. Simrad can supply a simple solution for this. This solution is suitable for smaller vessels, and it is made up of a little paravane and a weight. The arrangement is designed to draw the portable hydrophone down to approximate five to ten meters depth when towed at a moderate speed (maximum of three knots). The kit contains all necessary parts (except one!) as described in the following illustration.

Order number: KIT-207284



Paravane arrangement, parts

The relevant part numbers in the arrangement kit are provided in brackets.

(1) Towed hydrophone, portable type. Note that the hydrophone is NOT a part of the paravane kit, it must be ordered seperately. Order number is 314-203863.

(2) Paravane made of durable PVC plastic (598-079553).

(3) Paravane line, a two meter length of thin flag halyard (or the equivalent) shackled to the round thimble and the middle of the three holes available on the paravane (699-078608).

(4) Hydrophone cable, extending approximately a half meter aft of the round thimble. Note that the length of the paravane line (3) is four times longer than the hydrophone cable (4).

(5) Trolling weight, approximately 5 kg (598-079552).

(6) Hydrophone cable, maximum pay-out length approximately forty meters (total cable length is 50 meters).

(7) Round thimble, to which a bight in the hydrophone cable is seized to create an attachment point for the trolling weight and paravane line (598-079551).

(8) Shackle, made of brass (409-078633)

(9) Swivel, used between the trolling weight and the round thimble, shackles at each end (409-079550).

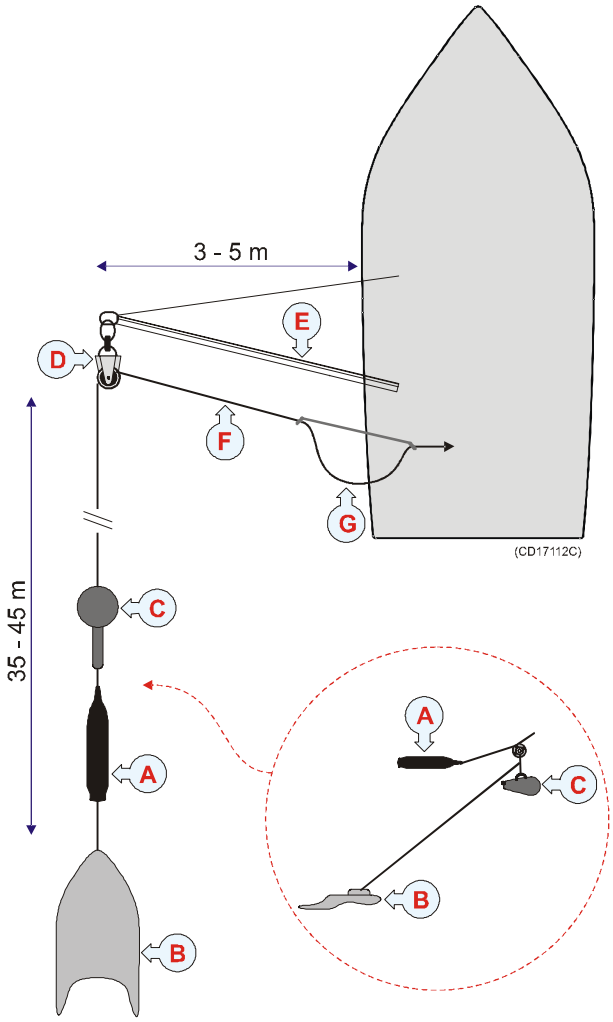
(10) Ring, made of stainless steel (409-078702).

(11) Shackle, made of stainless steel (409-086971).

(12) Seizing, used to secure a bight in the hydrophone cable to the round thimble (not supplied in kit).

Paravane deployment

All paravane installations require a boom or gantry capable of towing the hydrophone a minimum of three to five meters outboard of the vessel. This is important in order to avoid interference caused by the main propeller turbulence.



Should a portable hydrophone be towed in the wake of a vessel, its range will be severely reduced due to the associated main propeller wash which is saturated with air bubbles blocking the sensor signals. Systems incorporating hydrophones towed in this manner can be expected to barely work, if at all.

(A) Towed hydrophone, included with portable type hydrophone (314-203863).

(B) Paravane, included with KIT-207284.

(C) Trolling weight, included with KIT-207284.

(D) Snatch block, not available from Simrad.

(E) Boom, not available from Simrad.

(F) Hydrophone cable, included with the portable hydrophone.

(G) Bight, in hydrophone cable secured with an elastic strop to dampen dynamic stress on the hydrophone cable, not available from Simrad.

Portable hydrophone storage

The portable hydrophone and cable must not be left on deck unattended when not in use. When stored, observe the following precautions.

- Prior to storage, clean the hydrophone with fresh water.
- Take care so that the cable does not chafe due to the motion of the vessel.
- Avoid contact with sharp edges that could damage the hydrophone cable or the hydrophone.
- The hydrophone cable must not be knotted or kinked.

6 OPERATOR UNIT

Purpose

The purpose of this chapter is to provide general guidelines for the installation of the PI54 Operator Unit

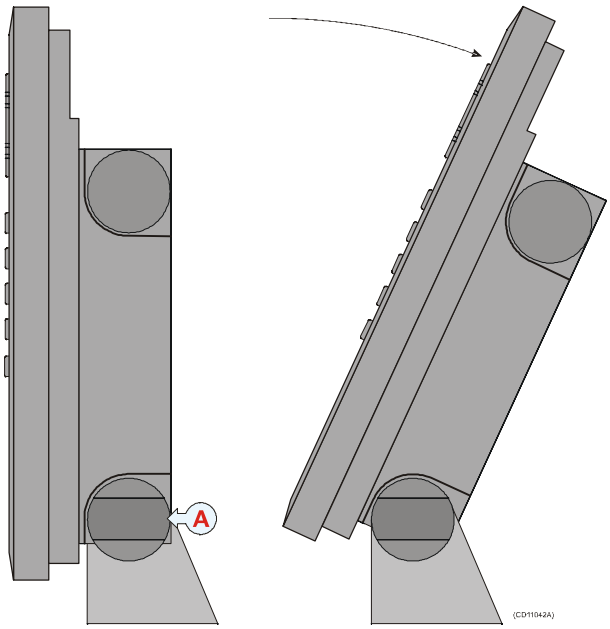
Topics

→ *Installation choices, page 128*
→ *Outline dimensions drawing, page 130*
→ *Panel cut-out drawing, page 131*
→ *Footprint drawing, page 132*

Installation choices

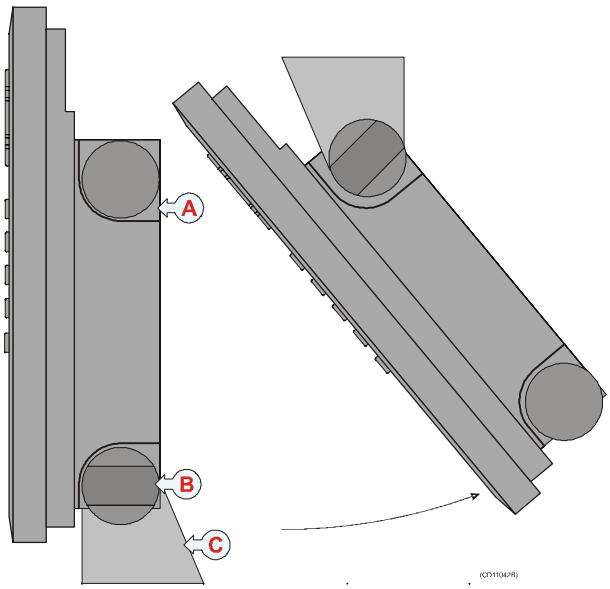
The PI54 Operator Unit can be installed as follows:

- Table
- Bulkhead
- Deckhead
- Panel/console



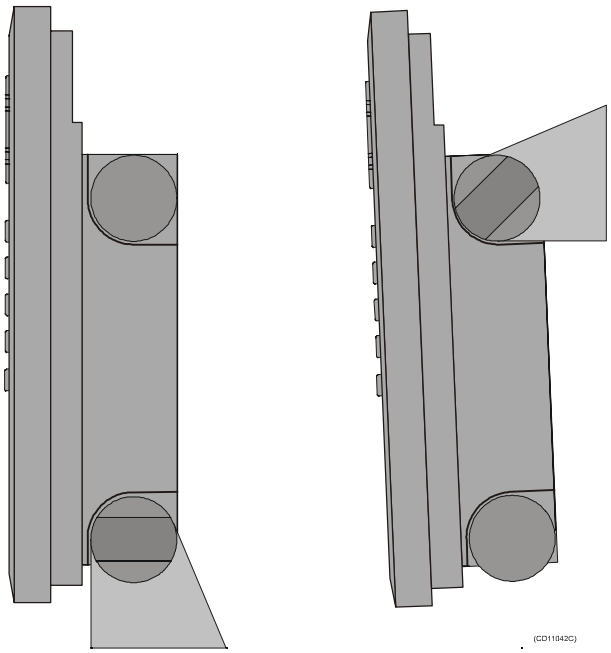
Table

Secure the mounting bracket with four bolts to the table. Loosen the large thumbscrews (A) on each side of the cabinet, and tilt the cabinet backwards to the preferred angle. Tighten the thumbscrews.



Deckhead

Use a small screwdriver to remove the two upper covers (A). Loosen and remove the large thumbscrews (B) and lock washers on each side of the cabinet. Move the mounting bracket (C) and fasten it on the top of the cabinet as shown. Secure the assembly to the deckhead using four bolts or screws, and tilt to preferred angle.



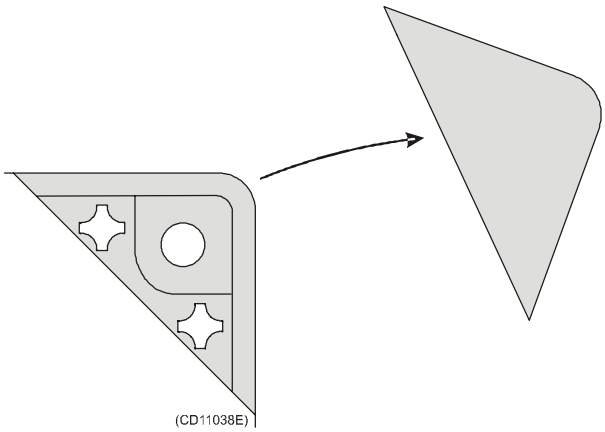
Bulkhead

Secure the mounting bracket to the upper or lower mounting holes. If you use the lower position you will be able to tilt the cabinet forward. If you wish to tilt the cabinet upwards, you need to use the upper mounting position.

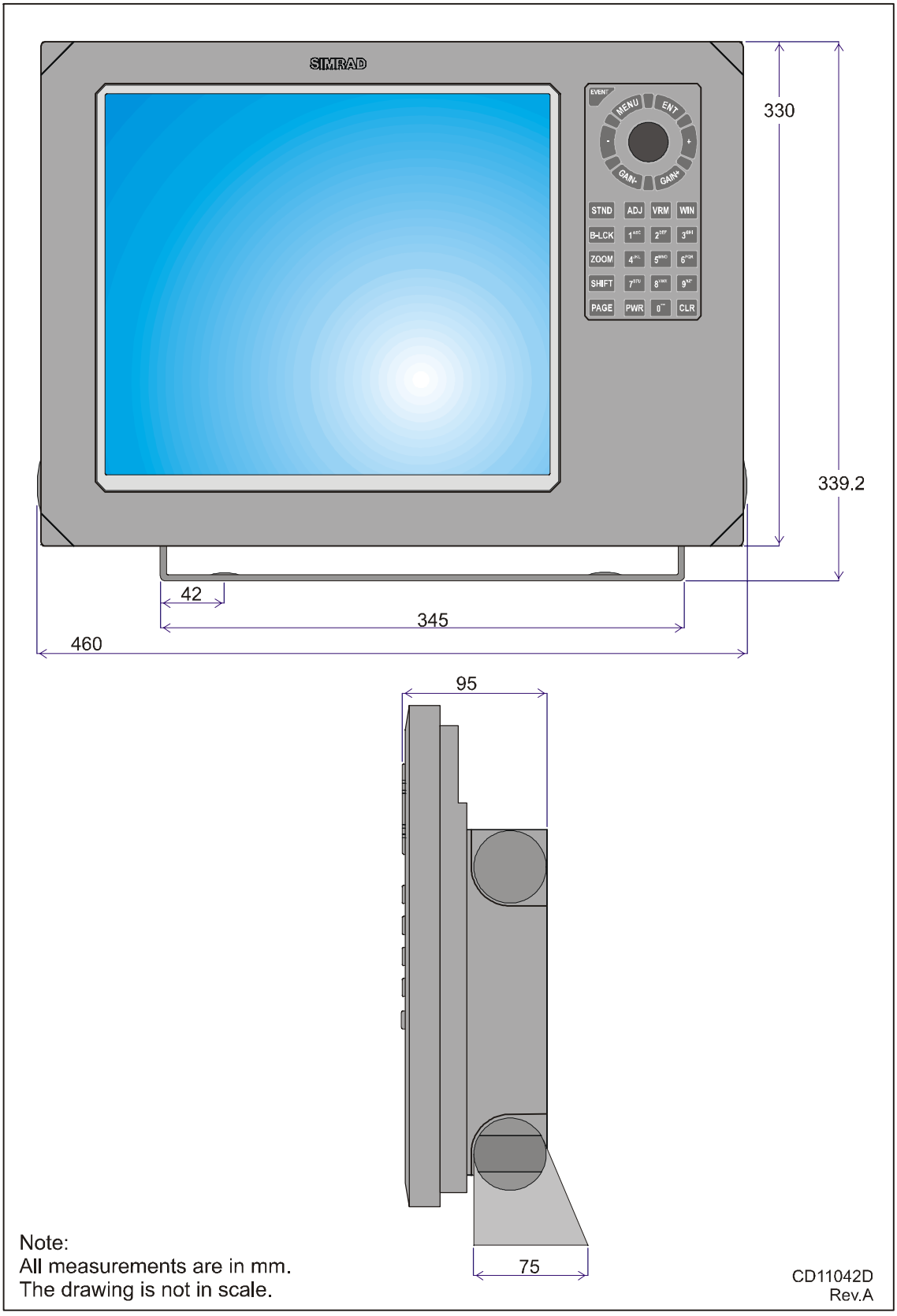
Panel mount

The PI54 Operator Unit can also be flush mounted in a panel or console. You will then need to make a rectangular hole with four holes for 4 mm mounting bolts.

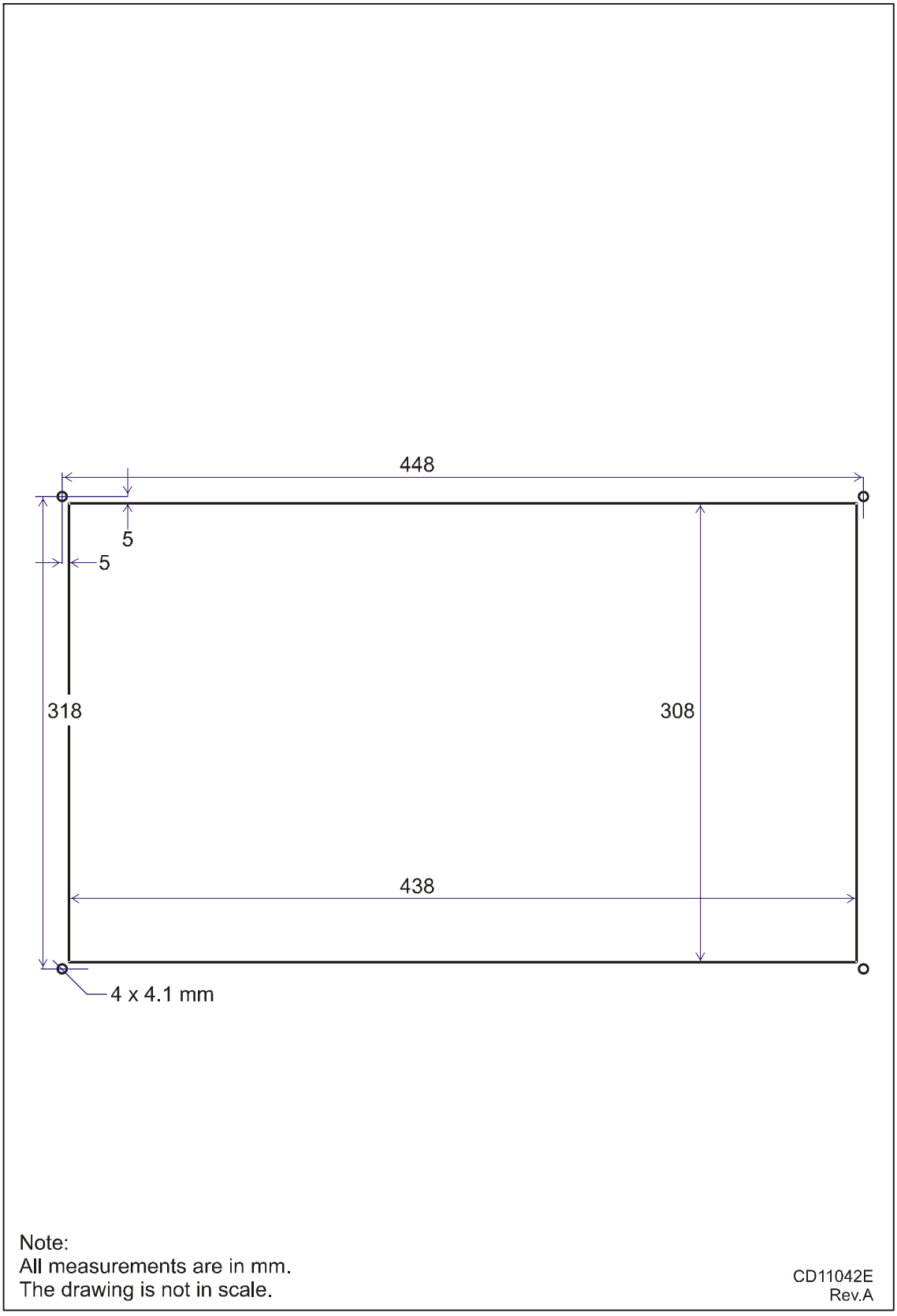
Use a screwdriver to carefully remove the four corner covers on the cabinet. Replace the covers when then bolts are in place.



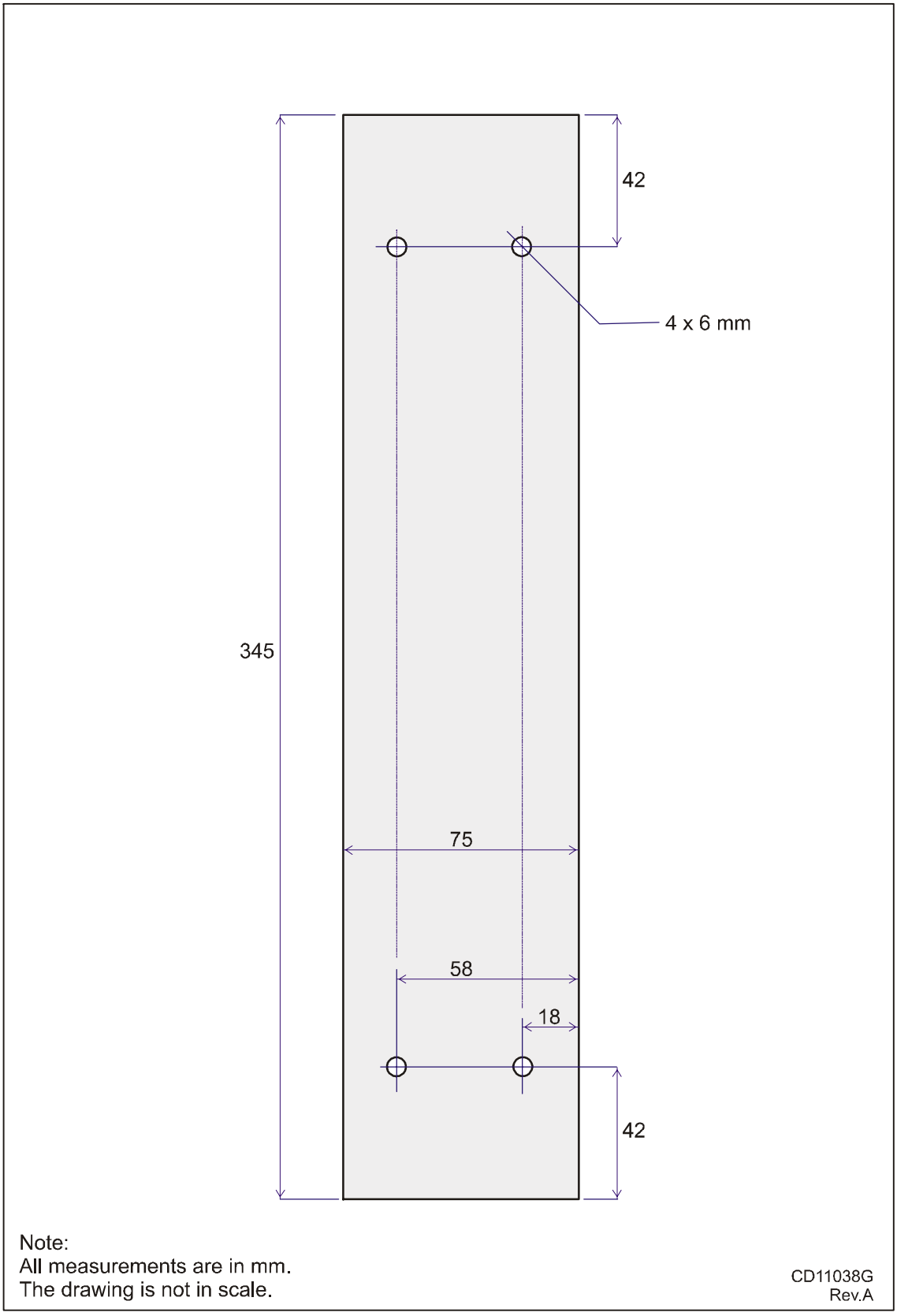
Observe that you will need an 11 cm minimum clearance behind the cabinet for the cables.



PI54 Outline dimensions



PI54 Panel cut-out



PI54 Footprint

7 SENSORS

The Simrad PI54 catch monitoring system can use a large range of sensors. These sensors are however not installed like the other items described in this manual, but fastened on the nets.

Topics

→ *Introduction to the sensors, page 134*

→ *Sensor configuration, page 139*

References

→ *For more information about the sensors, refer to the Operator manual and the Quick reference guides provided with each sensor.*

Introducing the sensors

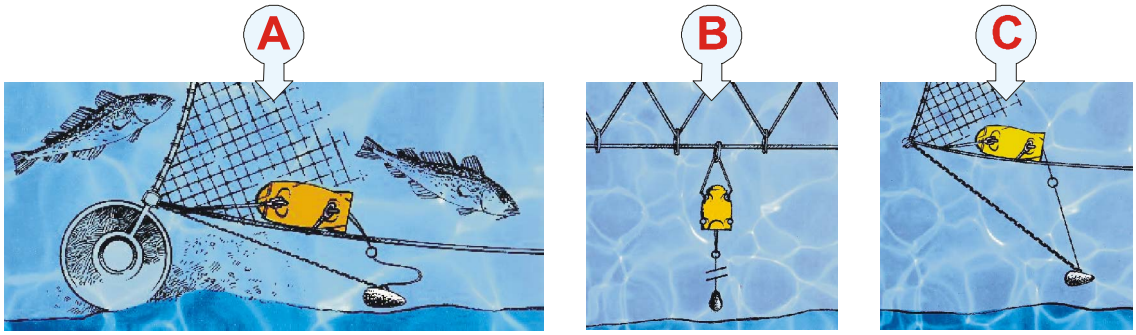
The PI54 catch monitoring can be used with a variety of sensors. All these sensors can be placed on your trawl or purse seine to monitor key parameters.

On the PI54, you can use maximum six sensors simultanously.

There are two sensor families; **PI** and **PS**. The sensors in the two families are almost identical, and they can be used together on the same PI54 system. The **PI** sensors will however offer increased range, some added functionality, and they can also be charged much faster using the **PI Charger**.

Bottom Contact: Best at the bottom!

With patented technology and awardwinning design, Simrad provides you full control of the actions that take place at the bottom. Mounted on a bottom trawl, pelagic trawl or purse seine, this sensor will provide the important information when you need it!



(CD11202C)

(A) = The Bottom Contact sensor mounted on a bottom trawl will let you know once the trawl lifts a few centimeters above the bottom. You can then immediatley perform the necessary adjustments, and you will not loose any catch.

(B) = On a purse seine you will be notified once the seine reaches the bottom, and you can thus fish even on a rough bottom.

(C) = On a pelagic trawl, the sensor will notify you once you get near the bottom.

The Bottom Contact sensor will let you know immediately if your gear touches the bottom.

- **Bottow trawl**: If your trawl lifts off the bottom, this may cause fish to escape, and hence reduce the catch. This sensor will detect this, and allow you to trim your equipment for perfect balance.

- **Pelagic trawl**: On a pelagic trawl, this sensor proves very useful when the trawl moves downwards. It will let you know immediately if the footrope touches bottom.
- **Purse seine**: When you work with a purse seine, you need to know when the seine reaches the bottom. This sensor will let you know. once it happens.
- **Danish seine**: Used on a Danish seine, the sensor will let you know when the net has a stable bottom contact, and when it is time to haul.
- **Scientific research**: During scientific surveys, an exact definition of towed distance with proper ground gear contact is an essential parameter in bottom trawl swept area estimates of fish abundance. Using a Bottom Contact sensor will reduce errors in this key parameter.

Catch sensor: When is the trawl full?

This is your “eye” at the cod-end. With PI Catch sensors in use, you can easily monitor the fi lling rate and the amount of catch in the trawl. Save time and fuel, haul in the trawl at the right moment! The design is rugged and awardwinning, and the sensor’s sensitivity is easily adjustable for trawls of all sizes.

Some professionals claim that the Catch sensor is the most important sensor on the trawl. Why? Because it will tell you the amount of catch in the trawl.

The sensor simply monitors the expansion of the meshes in the cod-end. Once the volume caught is enough to expand the meshes, they will pull the detector wires and engage the sensor. The sensitivity of the sensor can easily be adjusted, just extend the detection rubber bands to span additional meshes.

To monitor the filling rate, we recommend that you use minimum two sensors. Place the first sensor at the far end of the cod-end, it will tell you that the trawl is actually fishing. Place the second sensor closer to the trawl opening. Once the trawl is filled to the chosen location, the sensor is engaged, and you know that it is time to haul.

Use the PI Catch sensor to adjust the catch volume according to the production capacity, check that the trawl is fishing, adjust the caught volume to secure quality, and minimize the towing time to save fuel. These are only a few of the reasons why this sensor is considered to be so important.

Depth: How deep can you go?

When the sonar and echo sounder tell you how deep the school goes, it is good to know that you can place your fishing gear at the same depth. And even better, you can monitor and hold the desired depth. The design is rugged and awardwinning, and the sensor is available for three different depth ranges.

The PI Depth sensor provides information about the current depth and the depth changes of your gear.

- **Bottom trawl**: On a bottom trawl, you will use the sensor to achieve full control when shooting, and to position the trawl on the slope.
- **Pelagic trawl**: During pelagic trawling, you know how important it is to position the trawl relative to the largest concentration of fish. By using a Depth sensor, you can monitor the exact depth relative to the surface, and adjust the trawl depth accordingly. Additional depth sensors on the doors will monitor if the doors stay at the same depth.
- **Purse seine**: During seining, use the Depth sensor to monitor the depth of the net, and the descending speed of the net. Then you will know when to start pursing, and which speed to use.
- **Danish seine**: Mounted on a Danish Seine the Depth sensor monitors the sinking speed of the net, and it will tell you when to start hauling once the net has stopped sinking.

Height sensor: Accurate distance to the bottom!

With a built-in echo sounder, this new PI sensor is full of advanced technology. Wherever you place it, it will always tell you the exact distance to the bottom.

The height sensor measures the height over the bottom, that is the distance from the bottom and up to wherever the sensor is located. This provides you with a valuable range of applications for bottom and pelagic trawling.

- **Bottom trawl:** Place the sensor behind the headrope, and it will tell you the height of the trawl opening. This allows you to adjust you equipment immediately if the opening is reduced, and you will avoid loosing catch.
- **Pelagic trawl:** With a height sensor behind the footrope you will know at once if the trawl approaches the bottom. If you use a second sensor behind the headrope, the difference between the two measurements will give you the height of the trawl opening.

Rip: Check for damages!

The Rip sensor is identical to the Catch sensor, and can thus be regarded as a application for the Catch sensor. Place the sensor on the trawl belly behind the footrope, and use it to detect if the trawl is torn or in any other ways damaged by rocks or other roughness on the bottom. If this is detected immediately you can adjust the gear to minimise the damage.

Spread and Remote: Check the trawl doors!

This dynamic duo tells you the exact distance between the trawl doors. Used on bottom and pelagic trawls the Spread and Remote sensors provide crucial information about your trawl behaviour. On a twin trawl, simply add a Remote sensor and you have both openings covered!

These two sensors always work in pairs. They are used to monitor the physical distance between the trawl doors during bottom and pelagic trawling.

Use a Spread sensor on the port door and a Remote sensor on the starboard door. Both sensors are normally mounted in special adapters, but you may also attached them to the wing-end or warp using snap hooks or rope.

The Spread sensor communicates with the Remote sensor using a special transverse communication link. By means of this link it measures the excact distance (maximum 350 meters) between the two sensors. The information is is transmitted to the vessel by the Spread sensor.

As you already know, correct door spread is important in order to obtain the correct sweep-angle, as this ensures optimal trawl performance. Door behavior and stability during shooting and towing is also monitored by these sensors. Many regard this pair of sensors one of the most important sensors to obtain efficient trawling.

A special version of the PI Spread sensor, The **PI Twin Spread**, allows you to use a single Spread sensor with two Remote sensors to monitor a twin trawl.

Temperature: Too warm or too cold water?

Fishing in too warm or too cold water may be just a waste of time and money. The same applies to a pelagic trawl placed on the wrong side of a thermal layer. Using advanced technology, rugged construction and awardwinning design, the PI Temperature sensor allows you to increase your fishing efficiency.

The PI Temperature sensor tells you the exact sea water temperature while you are fishing.

The water temperature is an important parameter. Fish and bait are temperature sensitive, and they are normally found within specific temperature zones for feeding and spawning.

However, the temperature layers in the water are changing constantly, and for this reason the temperature must be monitored constantly. Fishing in an area with unfavourable water temperature might be just a waste of time!

For any kind of trawling, use this sensor to monitoring and log the temperature. Then, increase your knowledge about the correlation between temperature, fish concentration and catch efficiency. On a purse seine net, monitor the temperature to see when you are passing the thermo-cline.

Sensor configuration

Communication channels and update rates

All sensors are provided from the factory with pre-defined communication channels and update rates.

Sensor	Com.channel	Update rate
PI Bottom Contact	6	Normal
PI Catch	4	Normal
PI Depth (300 m)	16	Fast
PI Depth (600 m)	12	Fast
PI Depth (1000 m)	10	Fast
PI Height	14	Fast
PI Spread	2	Fast
PI Twin Spread	TBD	Fast
PI Temperature	8	Fast
Factory default communication channels and update rates		

It may be required to change one or more transmission channels, and the reasons would be:

- You have more than one of each sensor. For example, if you have three temperature sensors, they MUST communicate on three different channels.
- Other vessels near your use the same PI54 system (or a similar), and they have one or more of their sensors set up to the same communication channels as you have. This will create interference, as you will “read” each others sensors.
- If your sensors are set up to use communication channels too close to each other (for example, you have chosen channels 4, 5 and 6), this will limit the vessel’s speed. The reason for this is the doppler effect. If the speed is too high, the doppler will cause the transmission frequencies to change so much that they overlap, and this will create interference. The PI54 will provide a warning if this is about to happen! You must then either change to other communication channels further apart, or reduce the maximum shooting speed.
- If you operate at the maximum range of the sensors, you may be able to increase this range slightly if you use lower communication channels. This is because the lower communication channels user lower transmission frequencies.

To change the sensor setup, you can call your local Simrad dealer, or you can do it yourself if you have the proper equipment, training and the *PI Configurator* software.

PI Configurator

The **PI Configurator** application is provided to enable local sensor configuration. In order to perform this configuration, you will need a personal computer (desktop or laptop) running Microsoft® Windows® 2000 or Windows XP®, and a special cable.

Special configuration of PI Spread

The **PI Spread** sensor is always used with a **PI Remote** sensor, and these must be configured in a pair in order to make the transverse communication link work properly. In order to allow for a dual Spread application, you can use two predefined configurations: **PI Spread 1** and/or **PI Spread 2**.

The **Remote** sensors are available pre-programmed for these two pairs, and the sensors are identified as **Remote 1** and **Remote 2**.

The two pairs must be configured as follows:

Configuration	Spread sensor	Remote sensor
PI Spread 1	PI Spread (*)	Remote 1
PI Spread 2	PI Spread (*)	Remote 2
(*) = The same **PI Spread** sensor is used for both configurations. By default, it is programmed for **PI Spread 1**. If you wish to use it for **PI Spread 2**, you must re-configure it using the **PI Configurator** application.		

You can select the communication channels between the **PI Spread** sensors and the vessel to suit your preferences.

Special configuration of PI Twin Spread

The **PI Twin Spread** sensor is always used with two **PI Remote** sensors, and these must be configured as a group in order to make the transverse communication links work properly. In order to allow for a dual Spread application, you can use two predefined configurations: **PI Twin Spread 1** and/or **PI Twin Spread 2**.

The **Remote** sensors are available pre-programmed for these two pairs, and the sensors are identified as **Remote 1**, **Remote 2**, **Remote 3** and **Remote 2**. The two first (1 and 2) are the same sensors as for the standard PI Spread application.

The two groups must be configured as follows:

Configuration	**Spread sensor**	**Remote sensors**	
PI Twin Spread 1	PI Twin Spread (*)	Remote 1	Remote 3
PI Twin Spread 2	PI Twin Spread (*)	Remote 2	Remote 4
(*) = The same **PI Twin Spread** sensor is used for both configurations. By default, it is programmed for **PI Twin Spread 1**. If you wish to use it for **PI Twin Spread 2**, you must re-configure it using the **PI Configurator** application.			

You can select the communication channels between the **PI Twin Spread** sensors and the vessel to suit your preferences.

8 CABLE LAYOUT

This chapter describes the installation requirements for PI54 system cables. These instructions must be used together with the applicable cable plan.

Note: *All electronic installations and corresponding wiring must be in accordance with the vessel's national registry and corresponding maritime authority and /or classification society.*

If no such guide-lines exist, Simrad AS recommends that Det Norske Veritas (DNV) Report No. 80-P008 «Guidelines for Installation and Proposal for Test of Equipment» be used as a guide.

Related topics

→ *General cable requirements, page 162*

System cabling

Cable layout

Cables are identified with individual cable numbers (*Cxx*), and references are made to dedicated cable drawings.

Cable information includes:

- Required specifications
- Equipment they are connected to
- Corresponding terminations

System and shipyard cables

Cables fall into two categories:

- *System cables* supplied by Simrad with the standard PI54 system delivery.
- *Shipyard cables* provided by the shipyard performing the installation, or the shipowner. Cables to be provided by the installation shipyard are specified accordingly. Note that the cable specifications provided are the *minimum acceptable*. Detailed cable information is provided for the:
  - Connections at each end
  - Number of cores
  - Recommended type
  - Minimum specifications

Note: *Simrad accepts no responsibility for damage to the system or reduced operational performance caused by improper wiring.*

Related topics

→ *General cable requirements, page 162*

Cable plan

The PI54 cable plan is shown on the next page.

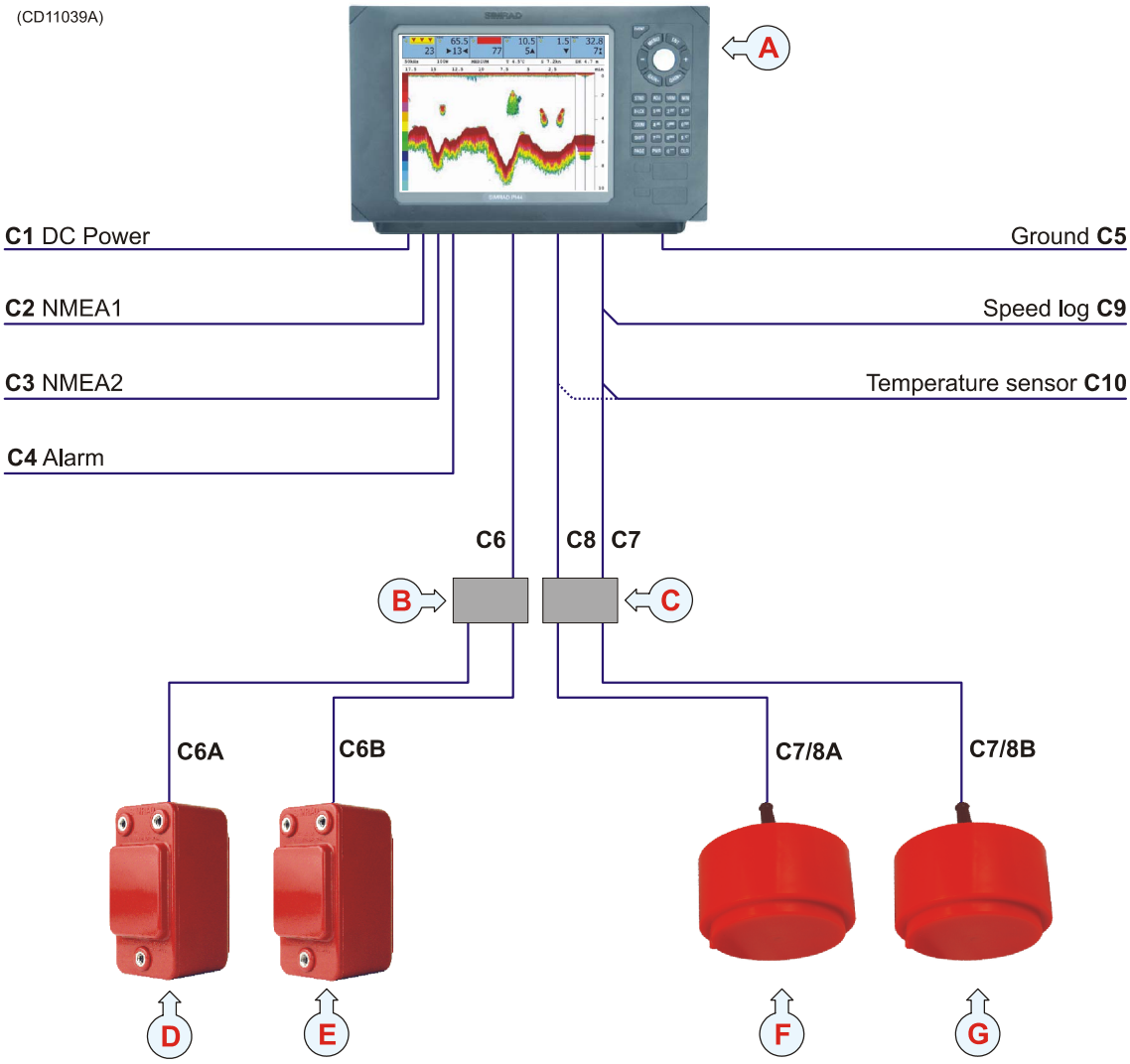
(A) = Operator Unit

(B) = Junction box and/or hydrophone selector switch. One or both can be used, and more than one junction box may also be required on large vessels.

(C) = Junction box (only if required).

(D) = (E) = Trawl or purse seine hydrophone. The PI54 can only be connected to one hydrophone, but by means of a selector switch you can choose to use additional hydrophones. You can also install both trawl and purse seine hydrophones on the same vessel and choose between these with the selector switch.

(F) = (G) = Echo sounder transducer. You can use several different types of echo sounder transducers. Some of these may be single frequency units, while others may be dual frequency transducers. On dual frequency transducers, only one transducer cable is required.


(CD11039A)
A
C1 DC Power
C2 NMEA1
C3 NMEA2
C4 Alarm
Ground C5
Speed log C9
Temperature sensor C10
C6
C8
C7
B
C
C6A
C6B
C7/8A
C7/8B
D
E
F
G

Cable specifications

The list below specifies each cable used by the PI54 catch monitoring system. References are made to the detailed cable drawings.

C1 - DC power supply

The PI54 Operator Unit operates on +10 to +32 Vdc. This voltage must be provided by an external power supply. This cable is provided with the delivery.

→ *Cable details (W201A), page 148*

C2 - NMEA1

The PI54 Operator Unit is equipped with two NMEA sockets; NMEA1 and NMEA2. Both are 9-pin sockets, but while NMEA1 is female, NMEA2 is male. The cable must be provided by the installation shipyard.

→ *Cable details (W201B), page 149*

C3 - NMEA2

Refer to the NMEA1 description provided for **C2**.

C4 - Alarm

The Alarm output allows you to take advantage of the built in alarm relay in the PI54. The relay contact may be used to switch off and on visible and/or audible alarms. The cable must be provided by the installation shipyard.

→ *Cable details (W201C), page 150*

C5 - Cabinet ground

This is the PI54 cabinet's connection to ship's ground. Use a 3 mm yellow/green grounding cable, and make sure that the connection is firm. The cable must be provided by the installation shipyard.

→ *Cable details (W201D), page 151*

C6 - Hydrophone

The hydrophone is connected to the ANT socket on the rear side of the PI54 Operator Unit.

→ *Cable details (W813), page 152*

Only one hydrophone can be connected at any one time. However, by means of manual or automatic switches, you can connect two hydrophones to the system. If your vessel performs both trawl and purse seine fishery, you can even install two sets of hydrophones, and switch between these.

Each hydrophone is supplied with approximately 22 meters of cable. Since the plug is too large to penetrate most cable glands, the cable has been cut 3 meters from the plug. In order to splice the cable you will need a metal junction box. A suitable box may be ordered from Simrad, or you can manufacture or purchase one locally.

→ *Hydrophone cable junction box (W813A), page 153*

C7 - Echo sounder transducer

You can connect one or two echo sounder transducers to the PI54 Operator Unit. Two sockets are provided on the rear side; **Echo1** and **Echo2**. Which of these to use depend on the chosen transducer(s).

→ *Echo sounder ECHO1 (W814A), page 154*

→ *Echo sounder ECHO2 (W814B), page 155*

The following specific connection diagrams have been provided for common transducers.

→ *Simrad 38-200 Combi C (W814C), page 156*

→ *Simrad 50-200 Combi C (W814D), page 157*

→ *Simrad 38-200 Combi D (W814E), page 158*

→ *Simrad 50-200 Combi D (W814F), page 159*

→ *Simrad 38-200 Combi W (W814G), page 160*

C8 - Echo sounder transducer

Refer to the cable description provided for **C7**.

C9 - Speed log

An external speed log may be connected to the **Echo1** socket. If you also have an echo sounder transducer connected to **Echo1**, you will need to use an external junction box to accomplish the wiring.

→ *Echo sounder ECHO1 (W814A), page 154*

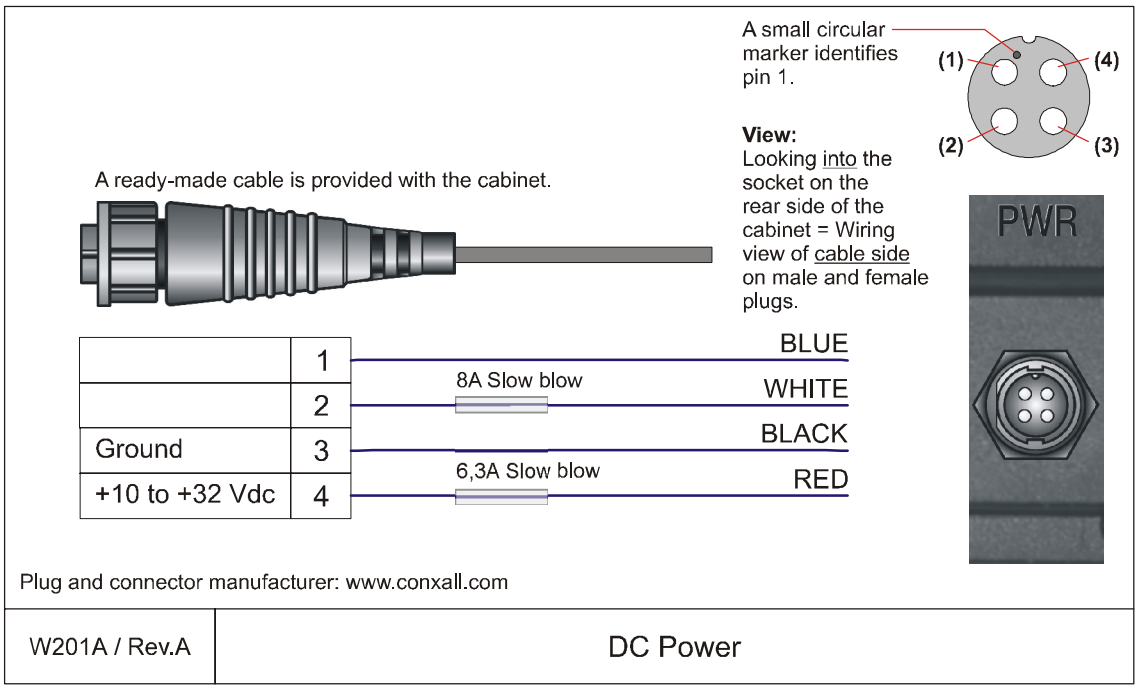
C10 - Temperature sensor

The echo sounder transducers recommended for use with the PI54 all have a built-in water temperature sensor. If you use a different transducer - without such a sensor - you can connect a separate temperature sensor to the **Echo2** socket. If you also have an echo sounder transducer connected to **Echo2**, you will need to use an external junction box to accomplish the wiring.

→ *Echo sounder ECHO2 (W814B), page 155*

DC Power cable

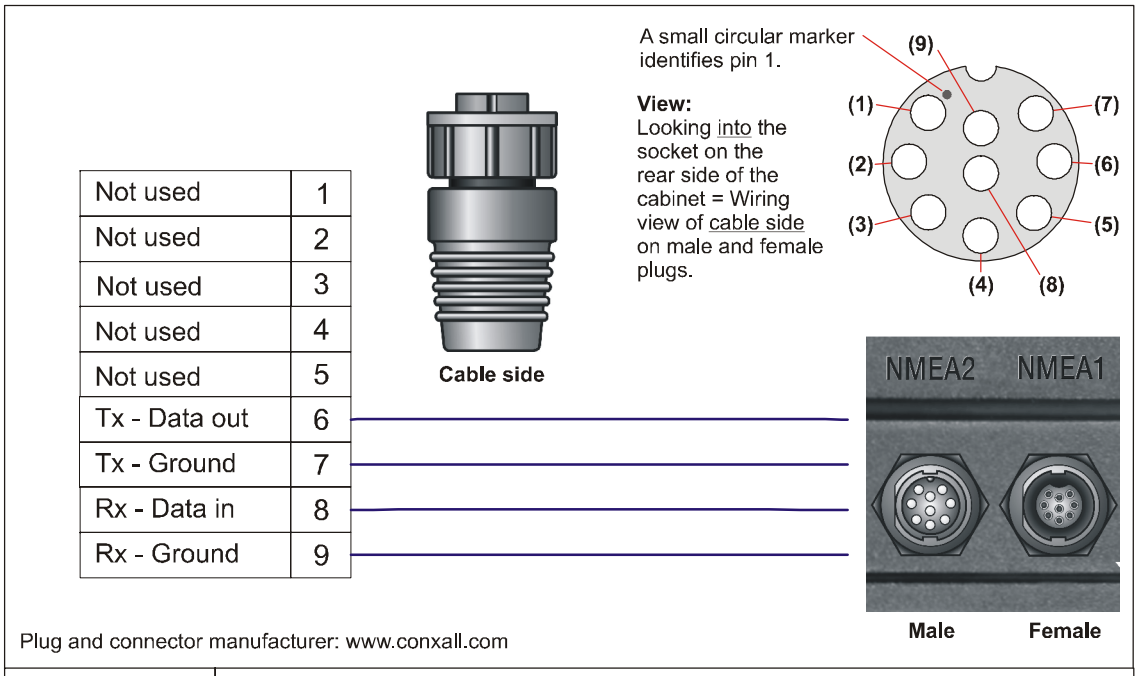
The power connection is made with a cable provided with the cabinet. Use **black** and **red** cables only. The blue and white cables may be cut off.



Cable specifications	
Conductors	4 x 0.5 mm2
Screen	Overall braided
Voltage	60V
Max.diameter	8 mm

NMEA1 and NMEA2

The serial line connections are made using two 9-pin plugs. NMEA1 is female, while NMEA2 is male. Two cables are supplied with the PI54, each with a connector fitted to one end of the cable. The other end of each cable is open, and allows you to connect to external devices through junction boxes or other means of connection.



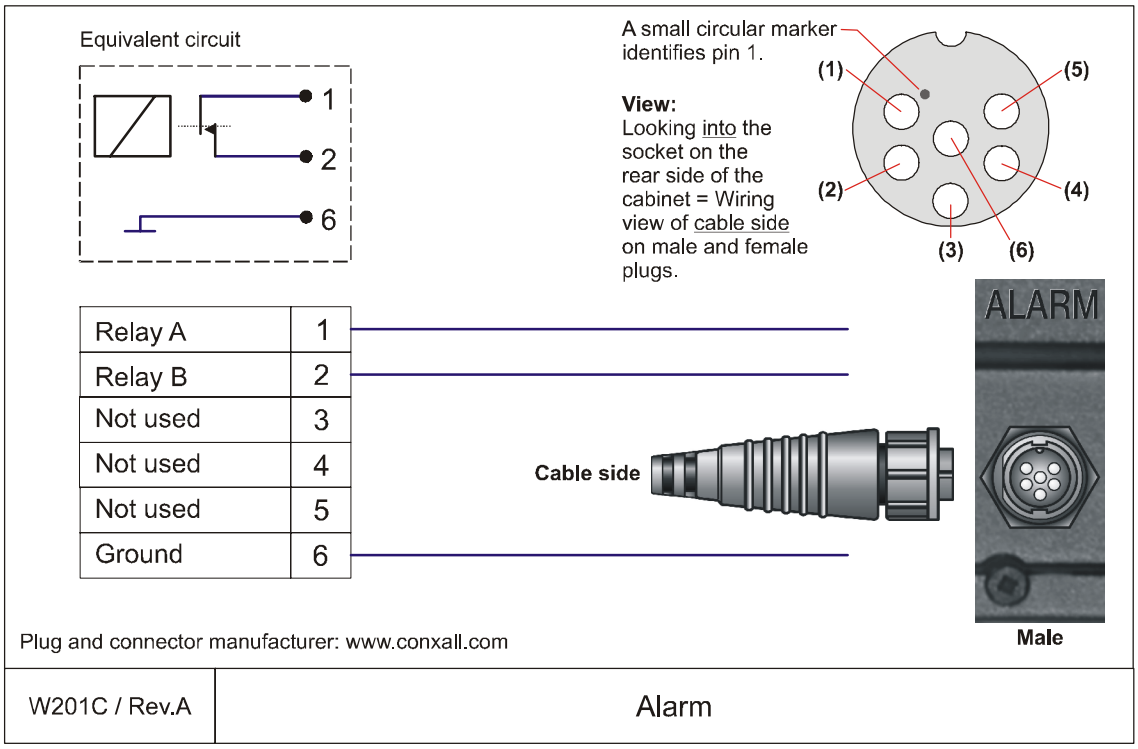
W201B / Rev.A	NMEA

Cable specifications	
Conductors	4 x 0.25 mm2
Screen	Overall braided
Voltage	60V
Max.diameter	8 mm

Alarm

The **Alarm** output allows you to take advantage of the built-in relay contacts.

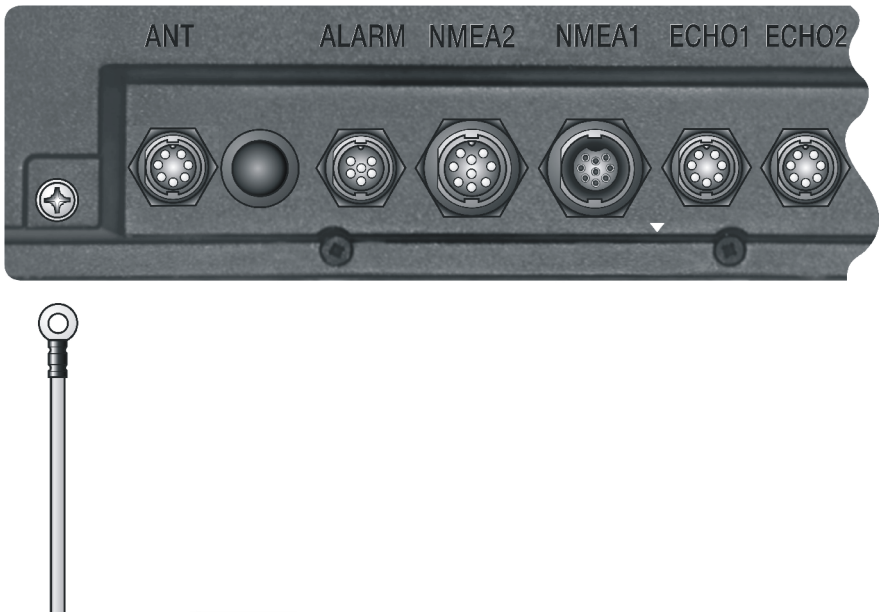
Maximum throughput on the relay contacts is 24 Vdc and 0.5 A.



Cable specifications	
Conductors	4 x 0.25 mm2
Screen	Overall braided
Voltage	60V
Max.diameter	8 mm

Cabinet ground

A firm ground connection is required.

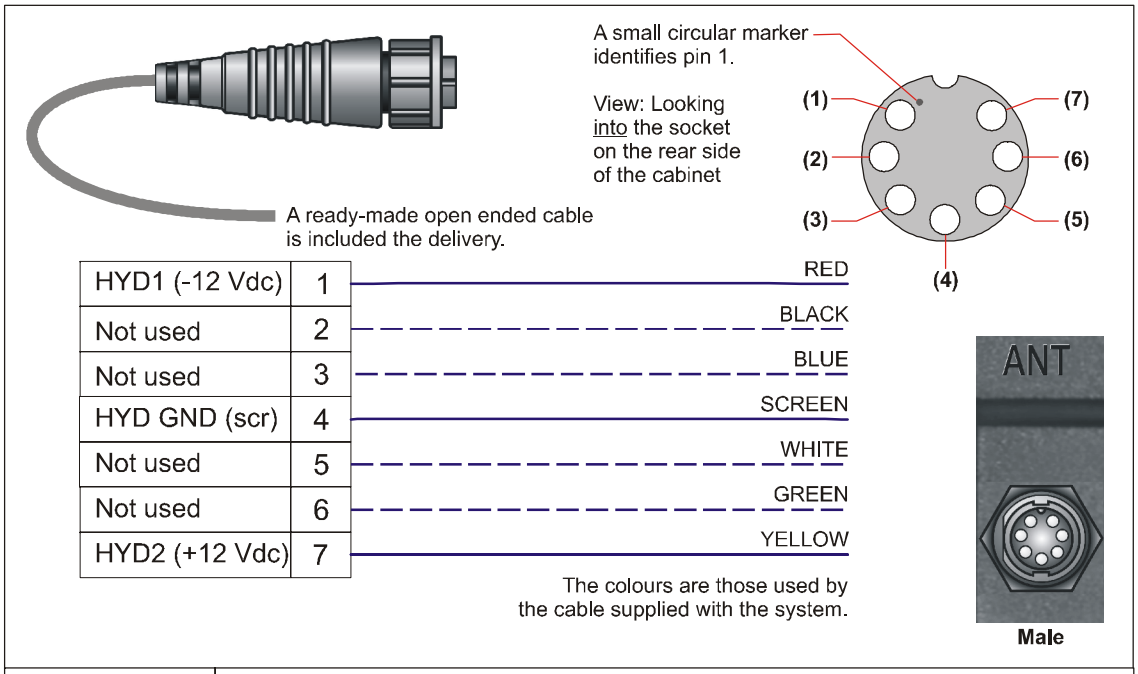


W201D / Rev.A	Cabinet ground

Cable specifications	
Conductors	1 x 3 mm2
Screen	Not applicable
Voltage	60V
Max.diameter	Not applicable

Hydrophone cable

The hydrophone is connected to the ANT socket on the rear side of the PI54 Operator Unit.

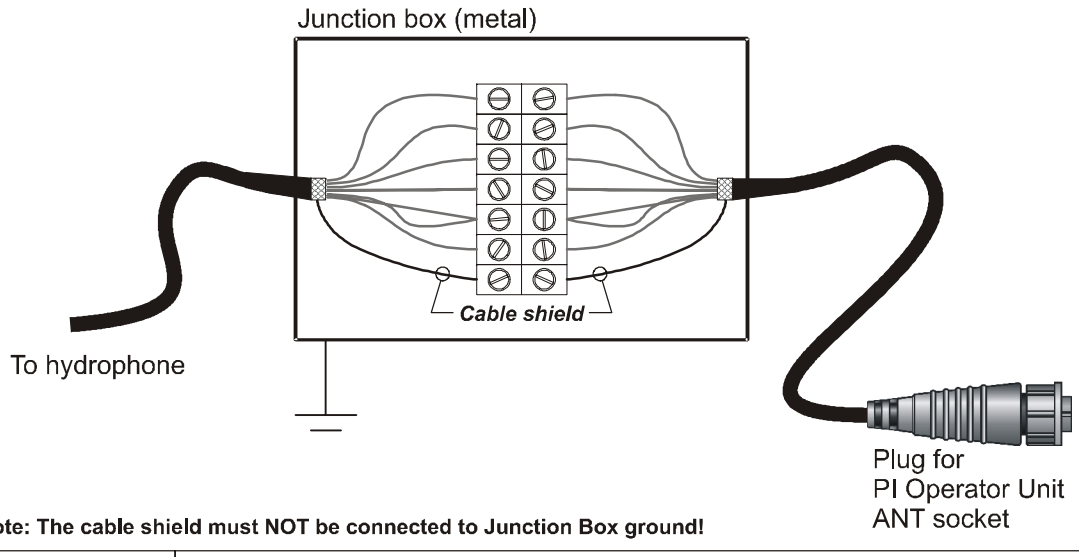

A small circular marker identifies pin 1.
View: Looking into the socket on the rear side of the cabinet
(1)
(2)
(3)
(4)
(5)
(6)
(7)
A ready-made open ended cable is included the delivery.
HYD1 (-12 Vdc) 1 RED
Not used 2 BLACK
Not used 3 BLUE
HYD GND (scr) 4 SCREEN
Not used 5 WHITE
Not used 6 GREEN
HYD2 (+12 Vdc) 7 YELLOW
The colours are those used by the cable supplied with the system.
ANT
Male

W813B / Rev.A	Hydrophone cable

Cable specifications	
Conductors	6 x 0.5 mm2 + GND
Screen	Overall braided
Voltage	60V
Max.diameter	8 mm

Junction box

The hydrophone cable will need to be spliced. DO NOT splice with solder and electrical tape, or by using a commercial terminal block for home lightning! You must use a metal box, and the box must be grounded. The cable shielding must however NOT be grounded in the junction box.

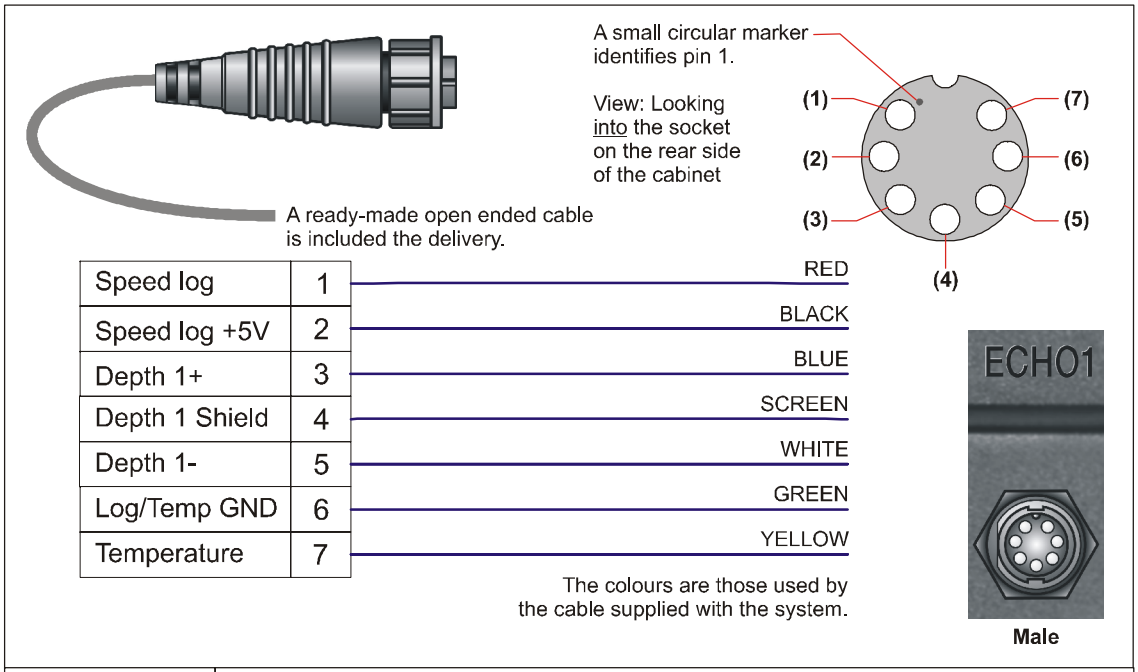


W813A / Rev.A	Hydrophone cable - Junction box

A suitable junction box must be provided by the installation shipyard.

Echo sounder transducer ECHO1

The ECHO1 socket is used to connect the PI54 Operator Unit to a single frequency echo sounder transducer, as well as external speed log and temperature sensors.

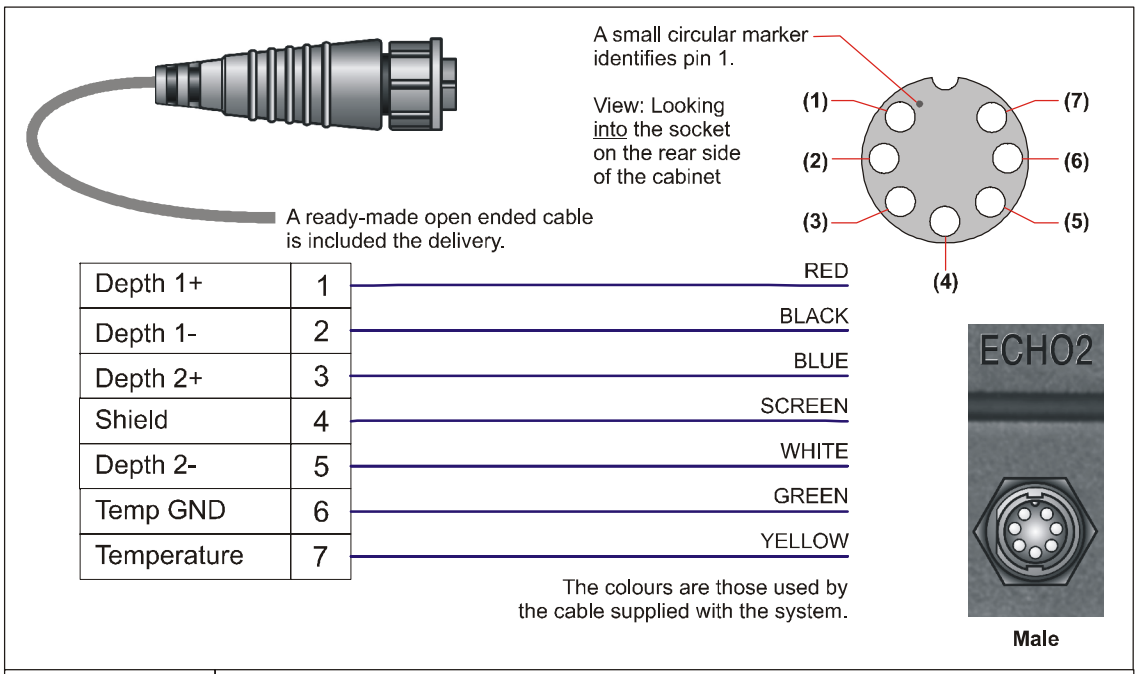


W814A / Rev.A	Transducer ECHO1

Cable specifications	
Conductors	6 x 0.5 mm2 + GND
Screen	Overall braided
Voltage	60V
Max.diameter	8 mm

Echo sounder transducer ECHO2

The ECHO2 socket is used to connect the PI54 Operator Unit to a dual frequency echo sounder transducer and an external temperature sensor.



W814B / Rev.A	Transducer ECHO2

Cable specifications	
Conductors	6 x 0.5 mm2 + GND
Screen	Overall braided
Voltage	60V
Max.diameter	8 mm

Simrad 38-200 Combi C

Observe the diagram below to connect the **38-200 Combi C** dual frequency transducer.

ECHO2 Connector			Simrad 38-200 Combi C	
Depth 1+	1	RED		200 kHz+
Depth 1-	2	BLACK		200 kHz-
Depth 2+	3	BLUE		38 kHz+
Shield	4	SCREEN		Shield
Depth 2-	5	WHITE		38 kHz-
Temp GND	6	GREEN		Thermistor
Temperature	7	YELLOW		Thermistor

The colours are those used by the transducer.

W814C / Rev.A	Simrad 38-200 Combi C transducer

Simrad 50-200 Combi C

Observe the diagram below to connect the **50-200 Combi C** dual frequency transducer.

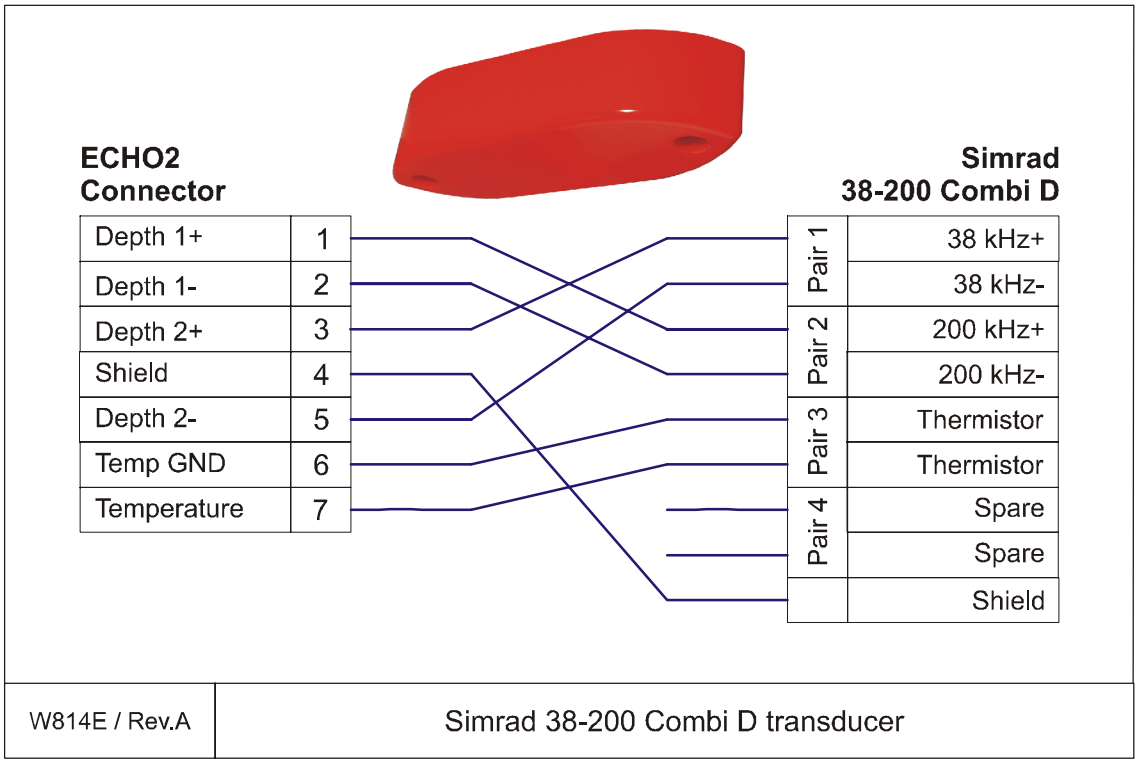
ECHO2 Connector			Simrad 50-200 Combi C	
Depth 1+	1	RED		50 kHz+
Depth 1-	2	BLACK		50 kHz-
Depth 2+	3	BLUE		200 kHz+
Shield	4	SCREEN		Shield
Depth 2-	5	WHITE		200 kHz-
Temp GND	6	GREEN		Thermistor
Temperature	7	YELLOW		Thermistor

The colours are those used by the transducer.

W814D / Rev.A	Simrad 50-200 Combi C transducer

Simrad 38-200 Combi D

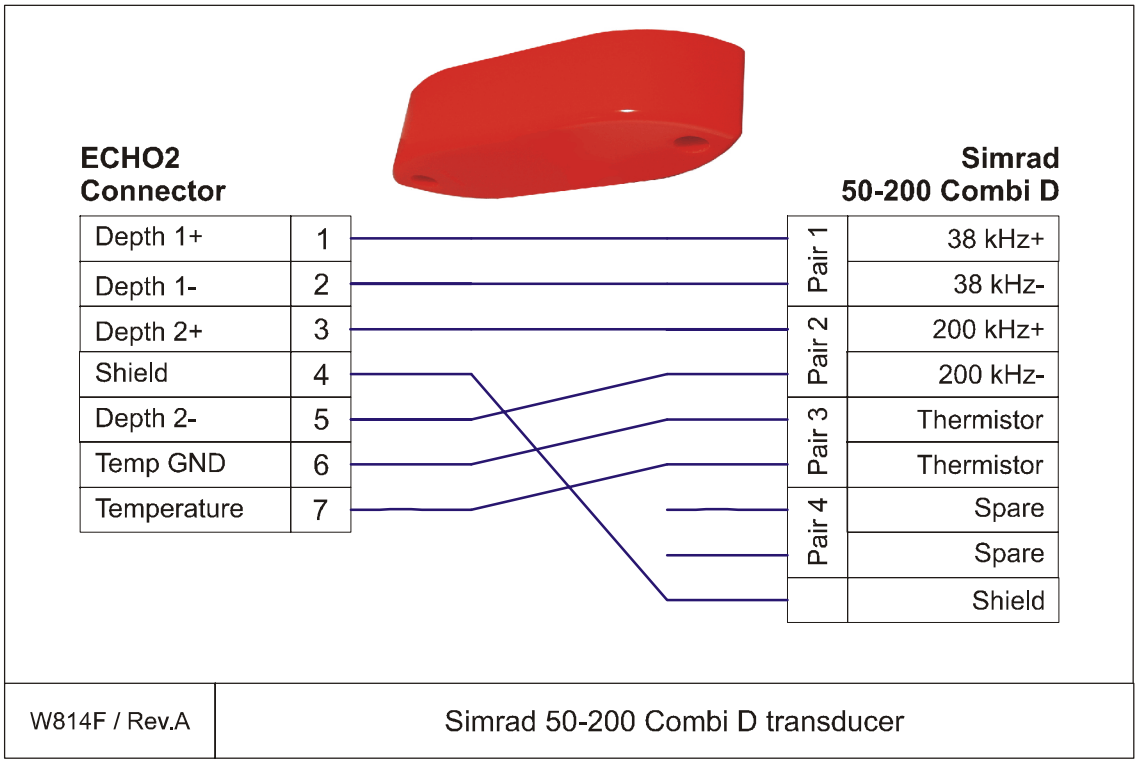
Observe the diagram below to connect the **38-200 Combi D** dual frequency transducer.



W814E / Rev.A	Simrad 38-200 Combi D transducer

Simrad 50-200 Combi D

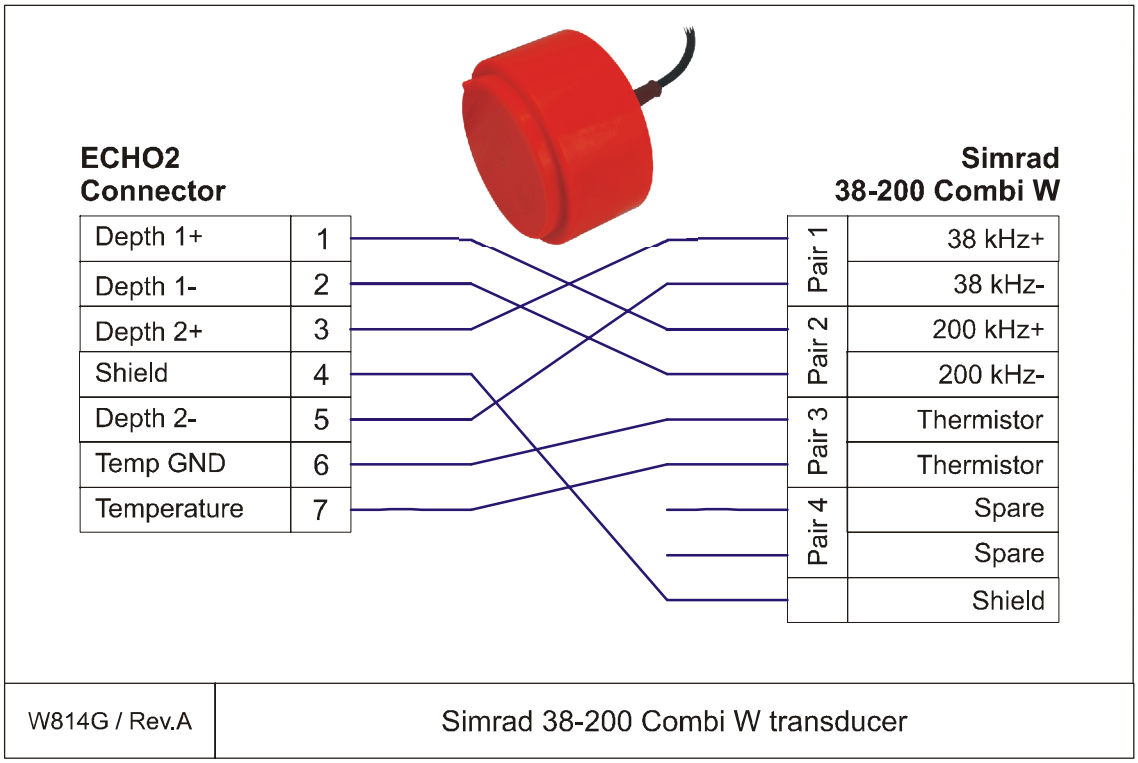
Observe the diagram below to connect the **50-200 Combi D** dual frequency transducer.



W814F / Rev.A	Simrad 50-200 Combi D transducer

Simrad 38-200 Combi W

Observe the diagram below to connect the **38-200 Combi W** dual frequency transducer.



W814G / Rev.A	Simrad 38-200 Combi W transducer

Note that the PI54 will automatically reduce the power output to the 38-200 Combi W transducer in order to compensate for the hogh power efficiency of this transducer.

Other transducers

Observe the table below to connect other echo sounder transducers.

TRANSDUCER	ECHO 1	ECHO 2	PINS
Airmar 50&200		50: Depth 1 200: Depth 2	Pins 1 and 2 Pins 3 and 5
Airmar 50 (/200)	50: Depth 1		Pins 3 and 5
Airmar 200 (/50)	200: Depth 1		Pins 3 and 5
User 38 kHz		Depth 2	Pins 3 and 5
User 50 kHz	Depth 1		Pins 3 and 5
User 200 kHz	Depth 1	Depth 2	Pins 3 and 5

Basic cabling requirements

Cable trays

All permanently installed cables associated with the system must be supported and protected along their entire lengths using conduits and/or cable trays. The only exception to this rule is over the final short distance (max. 0.5 metre) as the cables run into the cabinets/units to which they are connected. These short service loops are to allow the cabinets to move on their shock mounts, and to allow maintenance and repair.

- Wherever possible, cable trays must be straight, accessible and placed so as to avoid possible contamination by condensation and dripping liquids (oil, etc.). They must be installed away from sources of heat, and must be protected against physical damage. Suitable shields must be provided where cables are installed in the vicinity of heat sources.
- Unless it is absolutely unavoidable, cables should not be installed across the vessel's expansion joints. If the situation is unavoidable, a loop of cable having a length proportional to the possible expansion of the joint must be provided. The minimum internal radius of the loop must be at least twelve times the external diameter of the cable.
- Where a service requires duplicate supply lines, the cables must follow separate paths through the vessel whenever possible.
- Signal cables must not be installed in the same cable tray or conduit as high-power cables.
- Cables containing insulation materials with different maximum-rated conductor temperatures should not be bunched together (that is, in a common clip, gland, conduit or duct). When this is impractical, the cables must be carefully arranged such that the maximum temperature expected in any cable in the group is within the specifications of the lowest-rated cable.
- Cables with protective coverings which may damage other cables should not be grouped with other cables.
- Cables having a copper sheath or braiding must be installed in such a way that galvanic corrosion by contact with other metals is prevented.
- To allow for future expansion of the system, all cables should be allocated spare conductor pairs. Also, space within the vessel should be set aside for the installation of extra cables.

Radio Frequency interference

All cables that are to be permanently installed within 9 m (30 ft) of any source of Radio Frequency (RF) interference such as a transmitter aerial system or radio transmitters, must, unless shielded by a metal deck or bulkhead, be adequately screened by sheathing, braiding or other suitable material. In such a situation flexible cables should be screened wherever possible.

It is important that cables, other than those supplying services to the equipment installed in a radio room, are not installed through a radio room, high power switch gear or other potential sources of interference. Cables which must pass through a radio room must be screened by a continuous metal conduit or trunking which must be bonded to the screening of the radio room at its points of entry and exit.

Physical protection

Cables exposed to the risk of physical damage must be enclosed in a steel conduit or protected by a metal casing unless the cable's covering (e.g. armour or sheath) is sufficient to protect it from the damage risk.

Cables exposed to an exceptional risk of mechanical damage (for example in holds, storage-spaces and cargo-spaces) must be protected by a suitable casing or conduit, even when armoured, if the cable covering does not guarantee sufficient protection for the cables.

Metallic materials used for the physical protection of cables must be suitably protected against corrosion.

Grounding

All metallic cable coverings (armour, metallic sheathing etc.) must be electrically connected to the vessel's hull at both ends except in the case of final sub-circuits where they should be connected at the supply end only.

Grounding connections should be made using a conductor which has a cross-sectional area appropriate for the current rating of the cable, or with a metal clamp which grips the metallic covering of the cable and is bonded to the hull of the vessel. These cable coverings may also be grounded by means of glands specially intended for this purpose and designed to ensure a good ground connection. The glands used must be firmly attached to, and in good electrical contact with, a metal structure grounded in accordance with these recommendations.

Electrical continuity must be ensured along the entire length of all cable coverings, particularly at joints and splices. In no case should the shielding of cables be used as the only means of grounding cables or units.

Metallic casings, pipes and conduits must be grounded, and when fitted with joints these must be mechanically and electrically grounded locally.

Cable connections

All cable connections are shown on the applicable cable plan and interconnection diagrams.

Where the cable plan shows cable connections outside an equipment box outline, the connections are to be made to a plug or socket which matches the plug or socket on that particular item of equipment.

Where two cables are connected in series via a junction box or terminal block, the screens of both cables must be connected together but not grounded.

Cable terminations

Care must be taken to ensure that the correct terminations are used for all cable conductors, especially those that are to be connected to terminal blocks. In this case, crimped sleeve-terminations must be fitted to prevent the conductor core from fraying and making a bad connection with the terminal block. It is also of the utmost importance that where crimped terminations are used, the correct size of crimp and crimping tool are used. In addition, each cable conductor must have a minimum of 15 cm slack (service loop) left before its termination is fitted.

Cable identification

Cable identification codes corresponding to the cable number shown in the cable plan must be attached to each of the external cables. These identification codes should be positioned on the cable in such a way that they are readily visible after all panels have been fitted. In addition, each cable conductor should be marked with the terminal board number or socket to which it is connected.

9 INTERFACE SETUP

This chapter describes the setup procedures for the PI54 interfaces.

Topics

→ *Hydrophones, page 166*

→ *Echo sounder transducers, page 167*

→ *Positioning and navigation data, page 170*

→ *Water speed, depth and temperature data, page 173*

→ *Data output on NMEA format, page 177*

→ *NMEA interface verification, page 178*

Hydrophones

The PI54 will only interface with one hydrophone, but by means of external switches you may use more than one. Once the hydrohpne is connected to the PI54 Operator Unit, there are no further procedures.

→ *Cable details (W813), page 152*

Echo sounder transducers

Observe the following procedure to set up the echo sounder transducer(s).

1 Power up the PI54.

2 Once up and running, press the **MENU** button to open the main menu.

3 Press **4** to open the **Setup** menu, and **STND** to open the **Echosounder setup** dialogue.

Before you proceed, you must know what kind of echo sounder transducer(s) you have installed.

The PI54 can be used with maximum two transducers simultanously, one low frequency (38 or 50 kHz) and one high frequency (200 kHz). We recommend that any one of the following transducers are used:

- Simrad 38-200 Combi C (dual frequency)
- Simrad 38-200 Combi D (dual frequency)
- Simrad 38-200 Combi W (dual frequency, wide beam)

Other transducers may also be used. Budget transducers designed for leasure crafts are however not recommended for professional fishery applications.

Simrad 38/200 Combi C

Connect the transducer as described in the wiring diagram.

→ *Simrad 38/200 Combi C (W814C), page 156*

1 In the **Echosounder setup** dialogue, use the circular selector pad to move the cursor (inverse video) to the **Transducer 1 / Type** location.

2 Press the + button repeatedly until the setting reads **Simrad Combi 38&200**.

3 Press the **ENT** key to save the setting and exit.

You can easily return to this setup page later, but DO NOT alter the transducer setting unless you replace the transducer.

Simrad 38/200 Combi D

Connect the transducer as described in the wiring diagram.

→ *Simrad 38/200 Combi D (W814E), page 158*

1 In the **Echosounder setup** dialogue, use the circular selector pad to move the cursor (inverse video) to the **Transducer 1 / Type** location.

2 Press the + button repeatedly until the setting reads **Simrad Combi 38&200**.

3 Press the **ENT** key to save the setting and exit.

You can easily return to this setup page later, but DO NOT alter the transducer setting unless you replace the transducer.

Simrad 50/200 Combi C

Connect the transducer as described in the wiring diagram.

→ *Simrad 50/200 Combi C (W814D), page 157*

1 In the **Echosounder setup** dialogue, use the circular selector pad to move the cursor (inverse video) to the **Transducer 1 / Type** location.

2 Press the + button repeatedly until the setting reads **Simrad Combi 50&200**.

3 Press the **ENT** key to save the setting and exit.

You can easily return to this setup page later, but DO NOT alter the transducer setting unless you replace the transducer.

Simrad 50/200 Combi D

Connect the transducer as described in the wiring diagram.

→ *Simrad 50/200 Combi D (W814F), page 159*

1 In the **Echosounder setup** dialogue, use the circular selector pad to move the cursor (inverse video) to the **Transducer 1 / Type** location.

2 Press the + button repeatedly until the setting reads **Simrad Combi 50&200**.

3 Press the **ENT** key to save the setting and exit.

You can easily return to this setup page later, but DO NOT alter the transducer setting unless you replace the transducer.

Simrad 38/200 Combi W

Connect the transducer as described in the wiring diagram.

→ *Simrad 38/200 Combi W (W814G), page 160*

1 In the **Echosunder setup** dialogue, use the circular selector pad to move the cursor (inverse video) to the **Transducer 1 / Type** location.

2 Press the + button repeatedly until the setting reads **Simrad Combi W38&200**.

3 Press the **ENT** key to save the setting and exit.

You can easily return to this setup page later, but DO NOT alter the transducer setting unless you replace the transducer.

Caution: *Due to its high efficiency, the output power on the PI54 is reduced when the 38/200 Combi W transducer is chosen. If you choose an other transducer in the menu when the 38/200 Combi W is connected, you may damage the transducer beoynd repair.*

Other transducers

Connect the transducer as described in the wiring diagram.

Positioning and navigation data

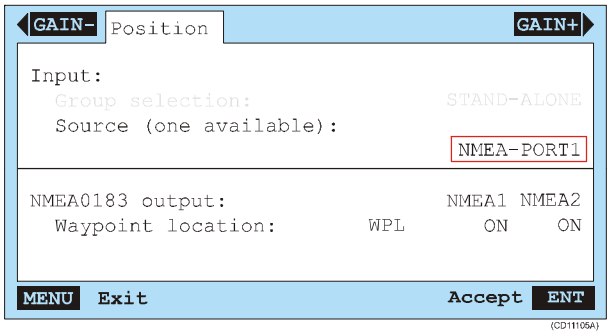
The PI54 will interface with external devices using NMEA connectors 1 and 2.

→ *Cable details (W201B), page 149*

Once the physical connections have been completed, you can use these procedures to ensure that all interfaces to external devices work properly. The following procedures are provided:

- Input from positioning system
- Input from navigation system

Positioning system



You can connect the PI54 to a positioning system by means of NMEA1 or NMEA2. In order to set up the PI54 to receive the information, observe the following procedure.

A typical setup page is shown. For more detailed information about the parameters, refer to the operator manual.

1 Ensure that the serial line between the PI54 and the positioning system is connected. Also, make sure that the positioning system is powered up and operational.

2 Power up the PI54. Once up and running, press the **MENU** button to open the main menu.

3 Press **4** to open the **Setup** menu, and **3** to open the **Interface setup** dialogue. Allow the PI54 some time to scan through the available inputs.

4 Press the **PAGE+** button twice to open the **Position** dialogue.

5 Observe that the PI54 has detected the positioning system.

- The setting **Source** will show the name or identification of the external system. Typically, the setting will read: **Source (one available)**.
- The name, identifiaction and/or input connector is shown on the next line.
- Note that if more than one positioning systems are detected, all will be listed.

6 If more than one positioning system are listed, move the cursor to the system you wish to use, and press the **ENT** button to select it.

7 If only one positioning system is shown, it is automatically selected by the PI54.

8 Press the **ENT** key to acknowledge the setting and exit.

If **Source** is set to **None**, the most likely reason is that you have a problem with the wiring.

Navigation system

You can connect the PI54 to a navigation system by means of NMEA1 or NMEA2. In order to set up the PI54 to receive the information, observe the following procedure.

A typical setup page is shown. For more detailed information about the parameters, refer to the operator manual.

1 Ensure that the serial line between the PI54 and the navigation system is connected. Also, make sure that the navigation system is powered up and operational.

2 Power up the PI54. Once up and running, press the **MENU** button to open the main menu.

3 Press **4** to open the **Setup** menu, and **3** to open the **Interface setup** dialogue. Allow the PI54 some time to scan through the available inputs.

4 Press the **PAGE+** button three times to open the **Navigation** dialogue.

5 Observe that the PI54 has detected the navigation system.

- The setting **Source** will show the name or identification of the external system. Typically, the setting will read: **Source (one available)**.
- The name, identifiaction and/or input connector is shown on the next line.
- Note that if more than one navigation systems are detected, all will be listed.

6 If more than one navigation system is listed, move the cursor to the system you wish to use, and press the **ENT** button to select it.

7 If only one navigation system is shown, it is automatically selected by the PI54.

8 Press the **ENT** key to acknowledge the setting and exit.

If **Source** is set to **None**, the most likely reason is that you have a problem with the wiring.

Note that most GPS systems will provide both navigation and positioning information.

Water depth, speed and temperature

The PI54 will interface with sensors for water depth, speed and temperature.

Cable details:

→ *Depth sensor (transducer) on ECHO1 (W814A), page 154*

→ *Depth sensor (transducer) on ECHO2 (W814B), page 155*

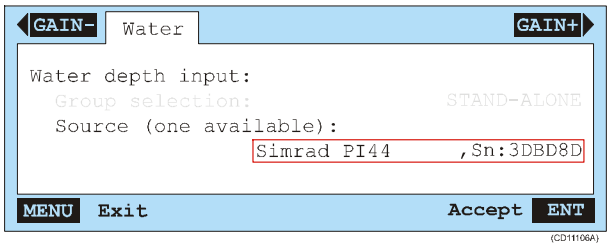
→ *Speed log on ECHO1 (W814A), page 154*

→ *Temperature sensor on ECHO2 (W814B), page 155*

Once the physical connections to the sensors have been completed, you can use these procedures to ensure that the interfaces work properly. The following procedures are provided:

- Input from depth sensor
- Input from water speed sensor (speed log)
- Input from temperature sensor

Depth sensor



The echo sounder transducer is the most likely depth sensor to be used, but you can also connect to external depth sensors using the NMEA interface.

A typical setup page is shown. For more detailed information about the parameters, refer to the operator manual.

1 Ensure that the sensor is connected to the PI54.

- If the echo sounder transducer is used, it must be connected to the **Echo1** or **Echo2** sockets.
- If you wish to use depth information from an external source, you must connect this external sensor to the **NMEA1** or **NMEA2** sockets.

2 Power up the PI54. Once up and running, press the **MENU** button to open the main menu.

3 Press **4** to open the **Setup** menu, and **3** to open the **Interface setup** dialogue. Allow the PI54 some time to scan through the available inputs.

4 Press the **PAGE+** button four times to open the **Water** dialogue.

5 Observe that the PI54 has detected the water depth sensor.

- The setting **Source** will show the name or identification of the external system. Typically, the setting will read: **Source (one available)**.
- The name, identifiaction and/oror input connector is shown on the next line.
- Note that if more than one depth sensors are detected, all will be listed.

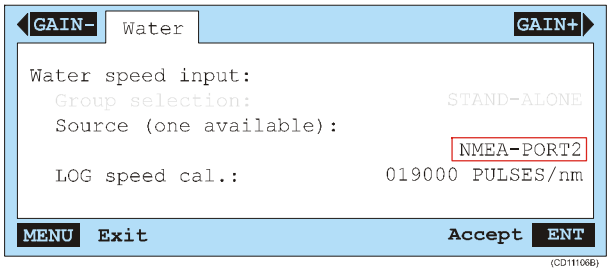
6 If more than one depth sensors are listed, move the cursor to the system you wish to use, and press the **ENT** button to select it.

7 If only one sensor is shown, it is automatically selected by the PI54.

8 Press the **ENT** key to acknowledge the setting and exit.

If **Source** is set to **None**, the most likely reason is that you have a problem with the wiring, or that an echo sounder transducer has not been connected.

Speed sensor



The speed sensor may be a separate unit, or it may be integrated with the echo sounder transducer. You can also connect to external water speed sensors using the NMEA interface.

A typical setup page is shown. For more detailed information about the parameters, refer to the operator manual.

1 Ensure that the sensor is connected to the PI54.

- If an echo sounder transducer with a buit-in speed sensor is, it must be connected to the **Echo1** socket.
- If you use a separate speed sensor it must be connected to **Echo1**.
- If you wish to use speed information from an external source, you must connect this external sensor to the **NMEA1** or **NMEA2** sockets.

2 Power up the PI54. Once up and running, press the **MENU** button to open the main menu.

3 Press **4** to open the **Setup** menu, and **3** to open the **Interface setup** dialogue. Allow the PI54 some time to scan through the available inputs.

4 Press the **PAGE+** button four times to open the **Water** dialogue.

5 Observe that the PI54 has detected the water speed sensor.

- The setting **Source** will show the name or identification of the external system. Typically, the setting will read: **Source (one available)**.
- The name, identifiaction and/or input connector is shown on the next line.
- Note that if more than one depth sensors are detected, all will be listed.

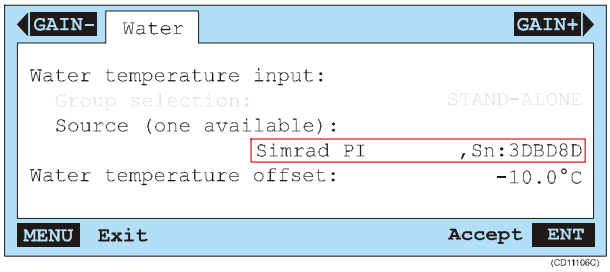
6 If more than one speed sensors are listed, move the cursor to the system you wish to use, and press the **ENT** button to select it.

7 If only one sensor is shown, it is automatically selected by the PI54.

8 Press the **ENT** key to acknowledge the setting and exit.

If **Source** is set to **None**, the most likely reason is that you have a problem with the wiring.

Temperature sensor



The temperature sensor may be a separate unit, or it may be integrated with the echo sounder transducer. You can also connect to external water speed sensors using the NMEA interface.

A typical setup page is shown. For more detailed information about the parameters, refer to the operator manual.

1 Ensure that the sensor is connected to the PI54.
- If an echo sounder transducer with a built-in temperature sensor is used, it must be connected to the **Echo2** socket.
- If you use a separate speed sensor it must be connected to **Echo2**.
- If you wish to use temperature information from an external source, you must connect this external sensor to the **NMEA1** or **NMEA2** sockets.

2 Power up the PI54. Once up and running, press the **MENU** button to open the main menu.

3 Press **4** to open the **Setup** menu, and **3** to open the **Interface setup** dialogue. Allow the PI54 some time to scan through the available inputs.

4 Press the **PAGE+** button four times to open the **Water** dialogue.

5 Observe that the PI54 has detected the temperature sensor.
- The setting **Source** will show the name or identification of the external system. Typically, the setting will read: **Source (one available)**.
- The name, identifiaction and/or input connector is shown on the next line.
- Note that if more than one temperature sensors are detected, all will be listed.

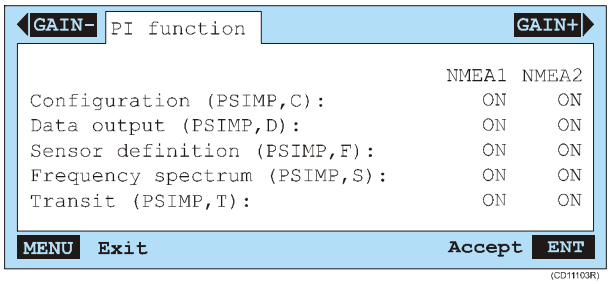
6 If more than one temperature sensors are listed, move the cursor to the system you wish to use, and press the **ENT** button to select it.

7 If only one sensor is shown, it is automatically selected by the PI54.

8 Press the **ENT** key to acknowledge the setting and exit.

If **Source** is set to **None**, the most likely reason is that you have a problem with the wiring.

Data output on NMEA format



You can connect the PI54 to external devices and transmit data to them by means of the NMEA1 and/or NMEA2 ports. In order to set up the PI54 to transmit the information, observe the following procedure.

A typical setup page is shown. For more detailed information about the parameters and the NMEA datagrams, refer to the operator manual.

1 Ensure that the serial line between the PI54 and the external system is connected.

2 Power up the PI54. Once up and running, press the **MENU** button to open the main menu.

3 Press **4** to open the **Setup** menu, and **3** to open the **Interface setup** dialogue. Allow the PI54 some time to scan through the available inputs.

4 Press the **PAGE+** button one time to open the **PI Function** dialogue.

- This page is used to set up the NMEA datagrams to be transmitted.

5 For each of the choices, enable or disable output on the NMEA ports.

6 Press the **PAGE+** button one more time to open the **Position** dialogue.

7 If you wish to output waypoint data, enable or disable the outputs on the NMEA ports.

8 Press the **PAGE+** button twice to open the **Water** dialogue.

9 If you wish to output water and depth related data, enable or disable the applicable outputs on the NMEA ports.

10 Press the **ENT** key to acknowledge the settings and exit.

You can transmit any information to any of the the NMEA ports, even though the same port may be used for receieving information from other external devices.

NMEA Interface verification

You can verify the NMEA data traffic in and out of the PI54 by opening the **NMEA0183 input** or **NMEA0183 output** pages.

These pages present the received and transmitted datagrams in real time. During normal operation the information on the pages is hard to read, due to the fact that the ongoing communication provides new data continuously. Also, you need to be well educated in NMEA datagram formats to be able to understand the context of the information.

However, the pages provide an easy way to see if the data are in fact being received and transmitted. You can even stop the continuous flow of data by pressing the **PAGE** button, and clear the screen with the **CLR** button.

Note: *When you press PAGE to stop the dataflow in the setup window, you will NOT stop the dataflow on the NMEA interfaces.*

10 INSTALLING SENSOR ADAPTORS

Introduction

The **PI Spread** and **PI Remote** sensor adaptors must be properly installed, and their protective cages fabricated correctly for the system to operate as designed. Misaligned sensors or cages that interfere with the sensors' communication signals will negatively effect system performance. It is therefore highly recommended that the installation of the **PI Spread** and **PI Remote** sensor adapters not be hastily undertaken, but rather carefully planed and then executed.

Installation keypoints

The **PI Spread** sensor must be mounted on the **port** door.

The **PI Remote** sensor must be mounted on the **starboard** door.

The installation of the adapters must ensure that there is an unobstructed line of sight between the sensor “eyes” for the transverse communication link. Also, there must be a free line of sight between the spherical head of the **PI Spread** sensor and the vessel to ensure an operational communication link.

For bottom trawling, the sensor adapter should be mounted to the upper part of the trawl door, and preferably at a place with minor influence on the centre of gravity. Consult the trawl door manufacturer or supplier if in doubt.

Adjust the tilt angle of the adapters according to your needs. 20 degrees is common for normal operation.

The adapter is designed to compensate for an angle of attack of approximately 40 degrees. The templates also provide lower angles.

Note: *The two rubber inserts provided must not be replaced with any other types or designs. It is essential that these inserts provide a secure cradle for the sensors, but they must also allow for free water circulation to allow the sensor’s water switch to engage. Also, the design of the inserts allows sand and mud to flow out when the trawl doors are pulled up from the water.*

The sensor adapters are manufactured from carbon steel, and must be welded to the trawl doors. For mounting on wooden trawl doors, dedicated mounting plates are available. The adapters must be surface treated to withstand the wear and tear.

Weight

PI Spread adapter, weight in water without sensor: 9.8 kg

PI Spread adapter, weight in water with sensor: 12.5 kg

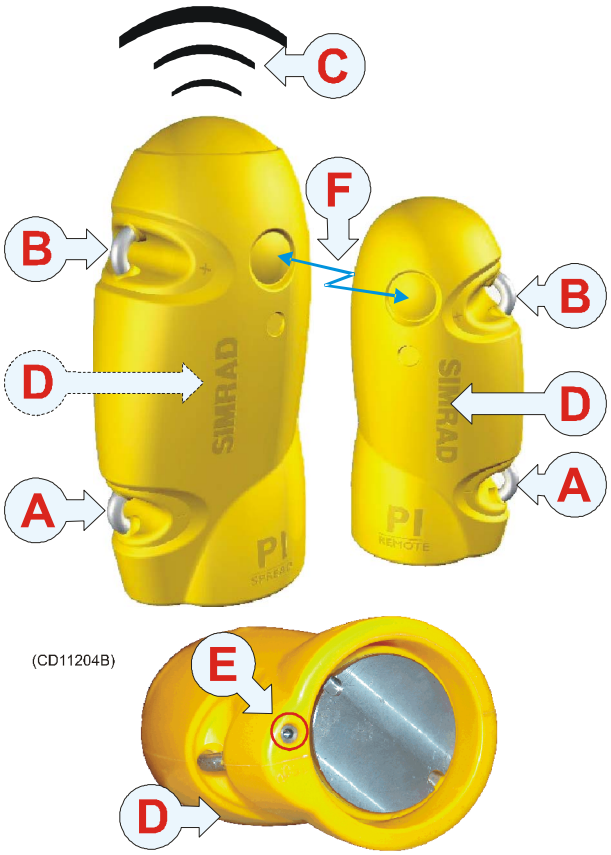
PI Remote adapter, weight in water without sensor: 8.8 kg

PI Remote adapter, weight in water with sensor: 10.1 kg

Optional supply

Mounting plate for **PI Spread** adapter for wooden door, use order no. 599-207541.

Mounting plate for **PI Remote** adapter for wooden door, use order no. 599-207551.



The PI Spread and PI Remote sensors:

(A) = Negative charging and fastening lug

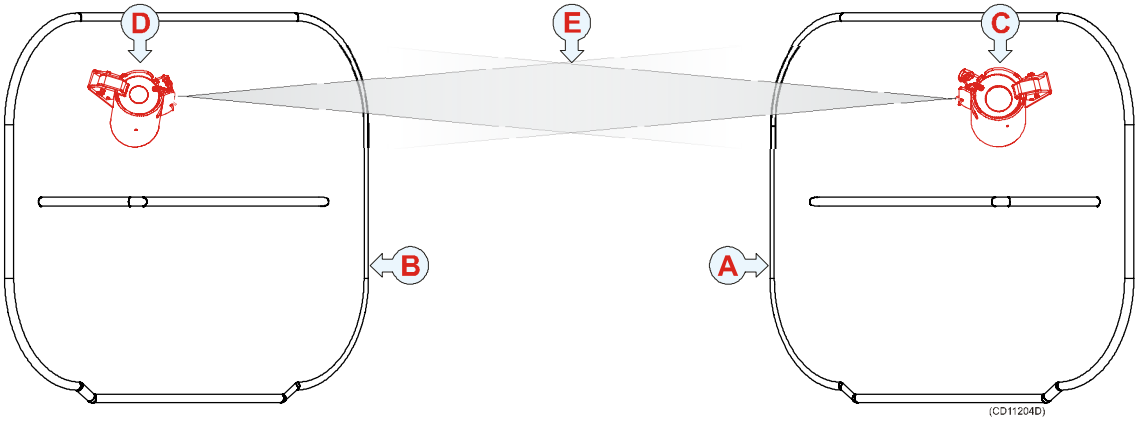
(B) = Positive charging and fastening lug

(C) = Communication link to vessel's hydrophone. Free line of sight must be provided.

(D) = Location of sensor lamp (rear side on PI Spread)

(E) = Water switch sensor, must have free access to the water once the door and sensor is deployed.

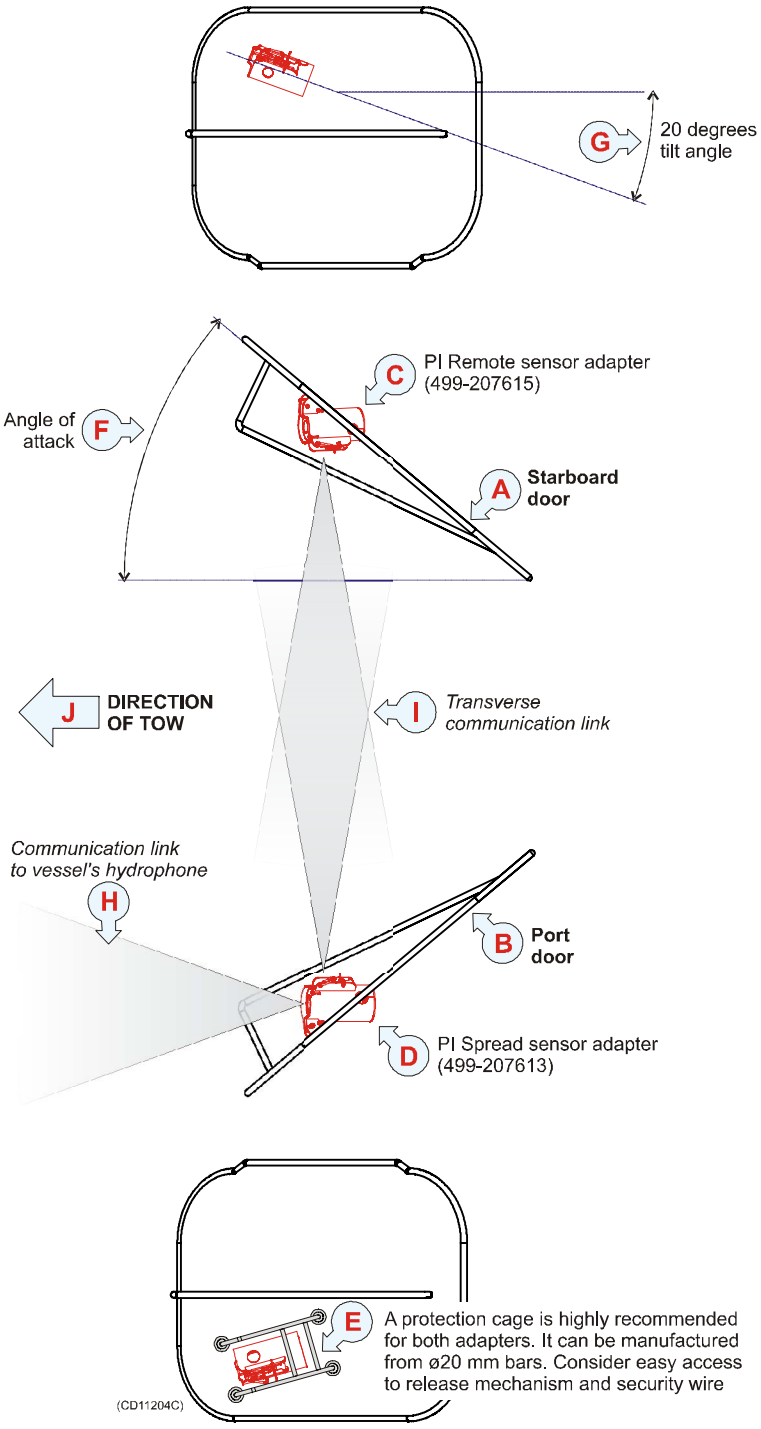
(F) = Transverse communication link, you must have free line of sight between the Spread and Remote sensors.



Trawl doors seen from the vessel:

(A) = Port door, (B) = Starboard door, (C) = PI Spread sensor, (D) = PI Remote sensor

(E) = Transverse communication link, must have free line of sight between the Spread and Remote sensors.



Location of sensor adapters:

(A) = Starboard door

(B) = Port door

(C) = PI Remote sensor adapter (499-207615)

(D) = PI Spread sensor adapter (499-207613)

(E) = A protection cage is highly recommended for both adapters. It can be manufactured from ø20 mm bars. Consider easy access to release mechanism and security wire.

(F) = Angle of attack

(G) = 20 degrees tilt angle

(H) = Communication link to vessel's hydrophone

(I) = Transverse communication link

(J) = Direction of tow

Before work begins

Proper preparation involves becoming familiar with all related documentation including:

- Drawings 830-208247 and 830-208246 in full size (1:1) printout.

With the proceeding information in mind:

- Determine the optimal sensor placement and orientation with regard to the intended operation of the vessel.
- Use the following procedures as a guide to create a specific work plan for the doors in question.
- Discuss and clarify all phases of the operation with the metalworker(s) performing the installation before beginning.

Procedure

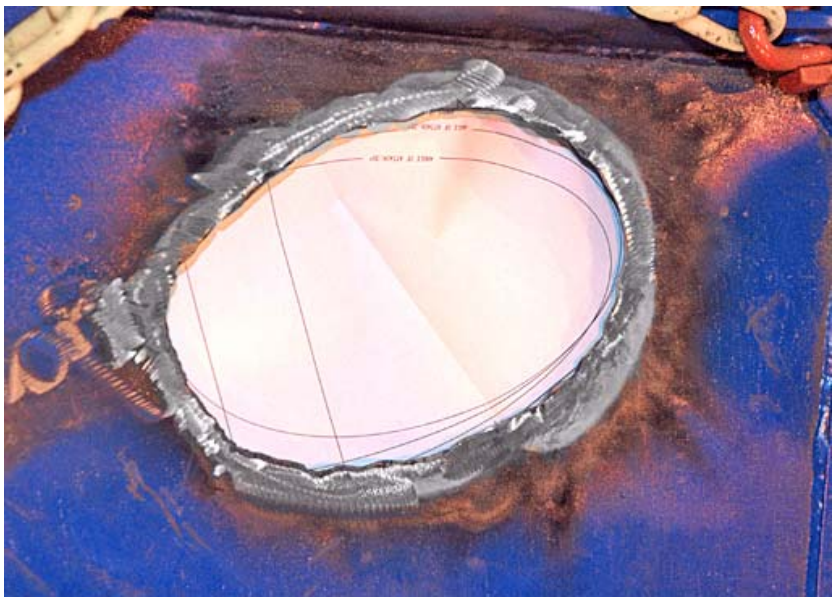
Observe the procedure on the next pages.

Note: *The information contained in this procedure is to be used as a guide. Deviations from the procedures listed may be necessary to accommodate a specific installation.*

STEP 1: Cut openings in the doors for the sensor adapters

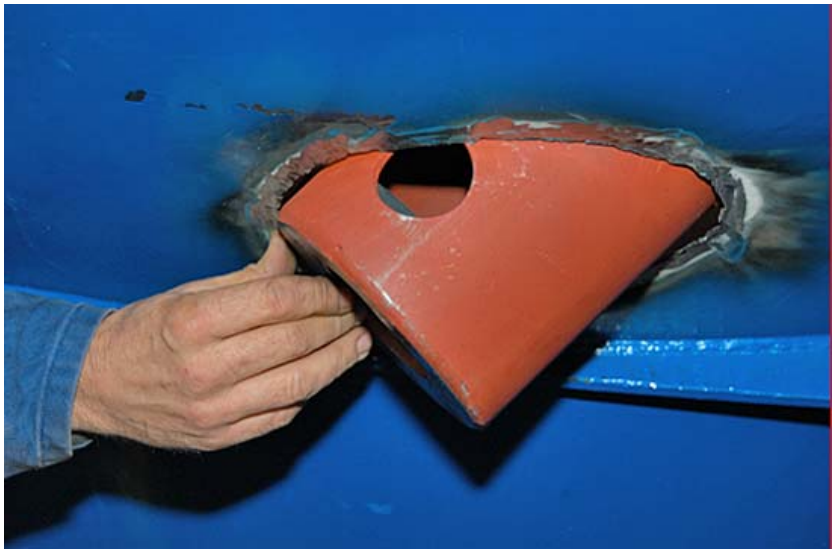
Using drawing **830-208247** as a guide, and mark off the areas to be cut out. Note that you need to have the drawing available in size 1:1.

Cut openings in the doors using an acetylene torch, check their accuracy against the full scale drawings when finished.



2) Orient the sensor adapters

Position the sensor adapters (port and starboard respectively) with the bottom portion just protruding through the back side of the door.



Carefully check that the adapters' angle and orientation are as close to those described in the drawings.

STEP 3: Mark the desired position of the sensor adapters

With the senor adapter held firmly in the correct position, trace a line around it using the inside surface of the door as a reference point.

Remove the sensor adapter. Using a centre punch and hammer, score the the adapter so that this reference line will not be lost when the primer is removed.

STEP 4: Dismantle the sensor adapters

Remove the sensor adapters' rubber inserts (two) before performing any hot work. Locking devices and internal plastic spacers may remain attached.

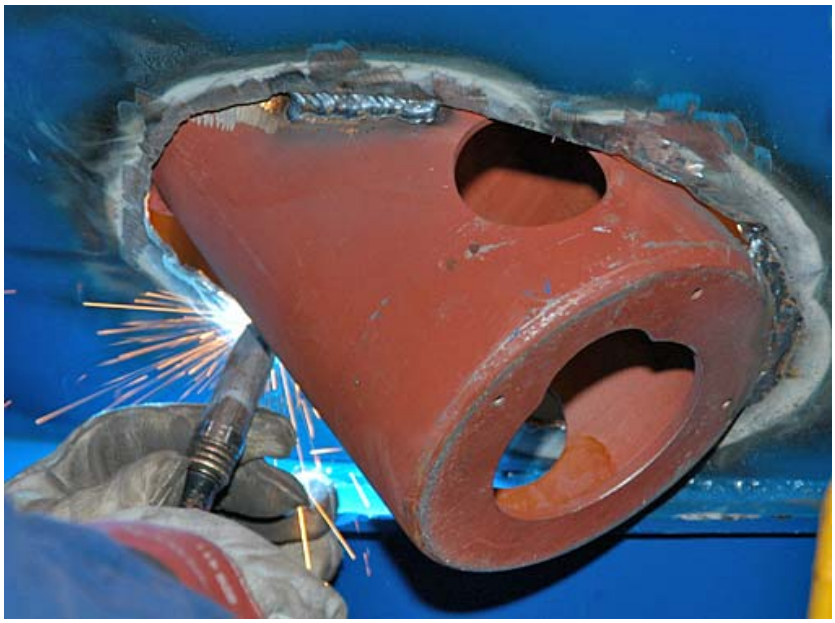
Note: *Over heating of either the sensor adapters or doors must be avoided though out the installation procedure.*

Note: *The two rubber inserts provided must not be replaced with any other types or designs. It is essential that these inserts provide a secure cradle for the sensors, but they must also allow for free water circulation to allow the sensor's water switch to engage. Also, the design of the inserts allows sand and mud to flow out when the trawl doors are pulled up from the water.*

STEP 5: Weld the sensor adapters to the doors

Tack weld sensor adapters in position using the reference line created in step 3 as a guide**.** Check that both angle and orientation are in agreement with the drawings.

Permanently weld the sensor adapters to the doors using 7 to 10 cm long beads, it is not necessary to use a continuous weld.



STEP 6: Measure the dimensions of the protective cage legs

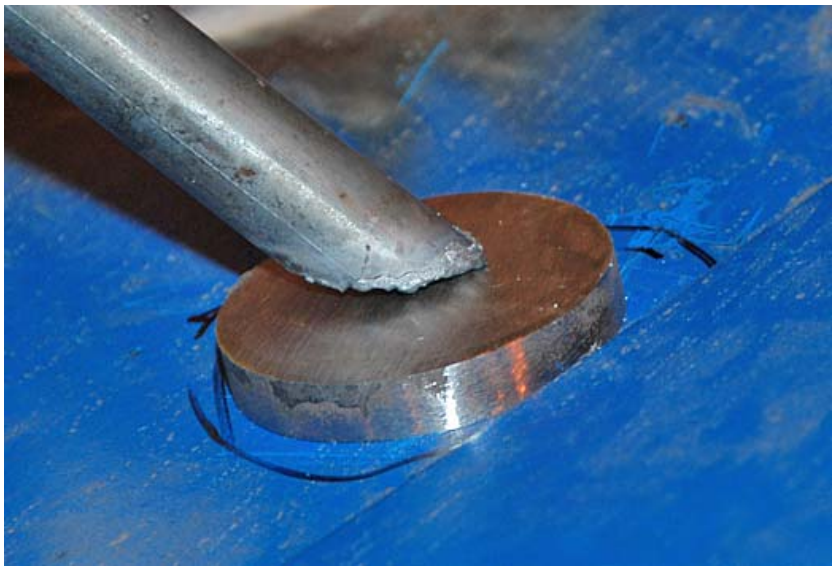
Using a yardstick bent at a ninety degree angle, measure the length of standard 20 mm diameter bar stock necessary for the apex of the protective cage to rise approximately 10 to 20 mm over the sensor adapters.

Note: *Mark the locations (on the doors) where the outboard protective cage legs will be welded.*

Cut and bent the bar stock accordingly.

STEP 7: Attaching the doubling plates

Place the appropriately sized doubling plates on the locations marked in step 6.

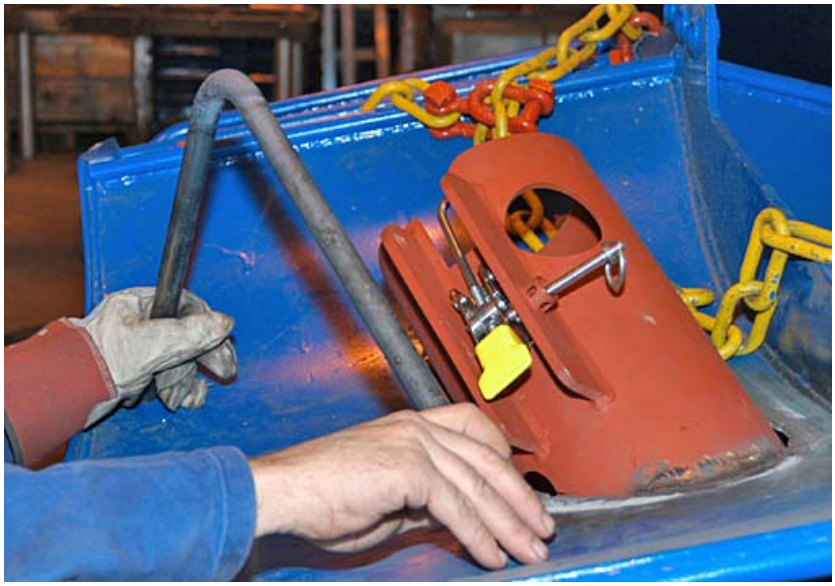


Temporarily holding the protective cage leg in place, check that the release mechanism operates freely.

Note: *There must always be enough space between a protective cage and its respective sensor adapter so that in the event it becomes bent, the sensor may still be removed.*

STEP 8: Attach the outboard protective cage legs

Tack weld the protective cage legs to the doubling plates. Check the alignment in relationship to the sensor adapter and its release mechanism, adjust as necessary.

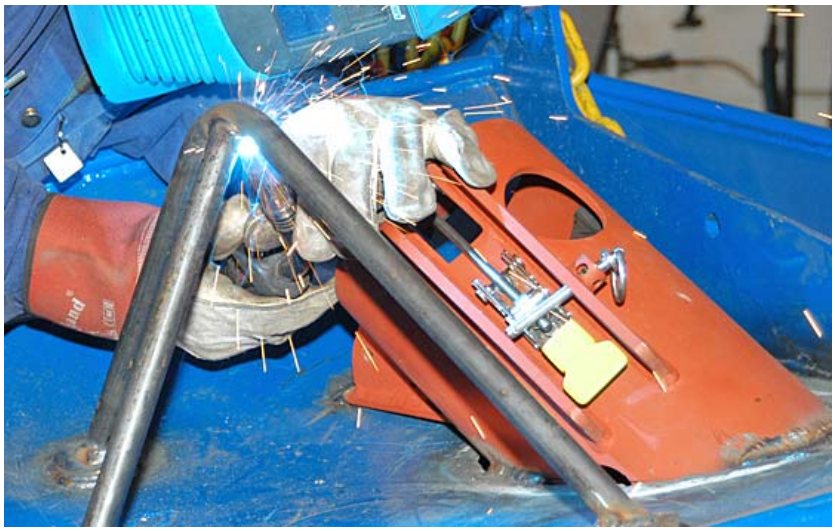


Weld the protective cage legs permanently in place.

STEP 9: Attach the outboard protective cage stiffener

Using a yardstick, and measure the length of standard 20 mm diameter bar stock necessary to span from the apex of the protective cage to the door.

Cut and weld the stiffener in place.



STEP 10: Fabricate and attach the inboard protective cage legs and stiffeners

Proceed in the same manner as described in steps 6 through 9.

The protective cage is now ready for priming and painting.

11 SOFTWARE UPDATES

Overview

You can update the operational software in the PI54 Operator Unit yourself by following the procedures provided. There are two different programs that must be updated independently:

- DPS (Digital Signal Processor)
- MMI (Man-Machine Interface)

The software can be distributed on CDs, by e-mail or by downloading the files from Simrad's website.

In order to perform the software updates, you will need a personal computer with a serial line connector, and a special upload cable.

Note: *Even though the software update procedures are uncomplicated, Simrad cannot be held responsible for errors or malfunctions that may occur after a software update, if the update has not been performed according to the procedures, or as a result of technical problems during the upload process.*

Topics

→ *DSP Software update, page 195*

→ *MMI Software update, page 199*

→ *The PI DSP Upload application, page 202*

DSP Software upgrade

Purpose

The DSP software is used by the digital signal processor inside the PI54 Operator Unit. This processor controls the interpretation of the coded signals from the sensors. Changing the DSP software will not change any of the menus or presentations on your PI54.

How to check the current version

To check which DSP software version that is currently installed on your PI54, observe the following procedure.

1 Press the **MENU** button to open the main menu.

2 Select **Fishery** on the main menu, and then **Status display**.

3 In the top right corner of the *Status display*, just beneath the numeric presentation, you will read the following sentence: **DSP = y.zz**

- **y.zz** is the current software version in use.
- When a new software version is released, it will always have a higher number.

Prerequisites

In order to upgrade the DSP software, you will need the following tools and equipment:

- A personal computer (desktop or laptop) with operating system Microsoft® Windows 2000® or Windows XP® and with a 9-pin serial line connector.
- Upload cable (Order no. 298-079853)
- PI DSP Upload program (Order no. 880-281039)
- DSP Software (Order no. 880-281036)

Note that once the upload process has started it will take more than one hour to complete it!

The program file

The DSP software program file is provided on the following format:

281036xx DSP Vyzz.hex

- **281036** is the last part of the order number, and Simrad's internal identification number for this software.
- **xx** is an internal version code.
- **DSP** identifies the software.
- **Vyzz** identifies the software version. You must read the information as **Vy.zz**.
- **.hex** means that the file is on hexadecimal format.

Procedure

In order to upgrade the DSP software, observe the following procedure.

1 Switch off the PI54.

2 Power up your computer.

3 Connect the upload cable between the 9-pin connector on your computer and the NMEA2 socket on the rear side of the PI54 Operator Unit.

4 Switch on the PI54.

5 Open the *Status display* and leave the PI54 on that page.

6 Start the **PI DSP Upload** program on your computer.

7 Select the COM Port (serial line connector) you have used to connect the upload cable.

- If you have more than one serial line connector and you do not know which is which, just try out the different COM ports until it works. An timeout error message will inform you if you have chosen the wrong COM port.

8 Click the **Select file** button to select the DSP software program file.

- The software file is provided on **.hex** format. The file name and how to interpret it has been previously explained.

9 If you wish to record the process in a log file, click **Want a log file**. Then, click the **Choose file name** button to select a log file or to create a new.

10 Click the **Upload file** button to start the upload.

11 Observe the messages provided by the program. They will keep you updated on the current status.

12 When the upload process has been started, do not switch off power on the PI54 or the computer, and do not unplug the upload cable.

13 Allow the process to finish. When the software has been uploaded, a message will inform you.

14 Switch off the PI54.

15 Switch on the PI54.

16 Verify that the new software version is shown in the *Status display.*

Messages

The PI DSP Upload program will keep you posted on the process by means of messages. A typical sequence for a successful upload is provided below as an example.

```
Upload File to Flash PROM started, Date: 31.05.05
Time: 12:48:48

Upload File Name is : V001.hex

MESSAGE: THE DSP ARE NOW IN FLASH PROM PROGRAMMING
MODE

MESSAGE: FLASH PROM IDENTIFIED

MESSAGE: START ERASING SCRATCH PAD IN FLASH PROM

MESSAGE: START PROGRAMMING SCRATCH PAD IN FLASH
PROM

MESSAGE: PROGRAMMING SCRATCH PAD IN FLASH PROM
COMPLETED

MESSAGE: START ERASING BOOT AREA IN FLASH PROM

MESSAGE: START MOVING NEW PROGRAM FROM SCRATCH PAD
TO BOOT AREA

MESSAGE: THE DSP HAS NOW FINISHED PROGRAMMING THE
FLASH PROM

SWITCH POWER OFF AND ON AGAIN TO START THE NEW
PROGRAM

Upload File to Flash PROM completed successfully,
Date: 31.05.05 Time: 13:59:17
```

Safety measures

The following safety measures have been implemented to minimize the risk of errors during the upload process.

- When the software is uploaded from the computer to the PI54 cabinet, the data are stored in a scratch pad (buffer). The data are not transferred to the Flash PROM (the microprocessor's storage area) until all software data have been transferred correctly to the scratch pad.

- If the upload cable is unplugged, or you loose power on the computer and/or the PI54 cabinet during the upload process, you can simply abort the upload and restart it. Error messages will provide guidance.
- When the PI54 cabinet detects that software is uploaded, it will automatically present a relevant information page, and the keypad will be locked. It is not possible to switch off the PI54 cabinet during the software upload, except by disconnecting power.

Critical process

Once all the software data have been uploaded correctly to the scratch pad, it will automatically be transferred to the microprocessor (Flash PROM). This is a critical process.

When the message **Start erasing boot area in Flash PROM** appears the internal transfer process has started. This process will only last a few seconds. The end of the criticial process is identified with the message **Switch power off and on again to start the new program**.

If you loose power on the PI54 cabinet during this critical internal transfer process, you can not restart the upload. You must then contact your Simrad dealer to have the PI54 cabinet shipped for reprogramming.

MMI Software upgrade

Purpose

The MMI software is used to create the menus and display presentations used in the PI54 Operator Unit, and to accept and handle the parameter settings. Changing the MMI software may change menus, presentations and parameter settings, and it may provide additional features on your PI54.

How to check the current version

To check which MMI software version that is currently installed on your PI54, observe the following procedure.

1. Press the **MENU** button to open the main menu.
2. Select **Fishery** on the main menu, and then **Status display**.
3. In the top right corner of the *Status display*, just beneath the numeric presentation, you will read the following sentence: **Main = y.zz**
   - **y.zz** is the current software version in use.
   - When a new software version is released, it will always have a higher number.

Prerequisites

In order to upgrade the MMI software, you will need the following tools and equipment:

- A personal computer (desktop or laptop) with operating system Microsoft® Windows 2000® or Windows XP® and with a 9-pin serial line connector.
- Upload cable (Order no. 298-079853)
- MMI Software (Order no. 880-281037)

Note that the MMI software upgrade file includes an upload program that will run on your computer.

The program file

The MMI software upgrade file is provided on the following format:

281037xx MMI Vyzz.exe

- **281037** is the last part of the order number, and Simrad's internal identification number for this software.
- **xx** is an internal version code.
- **MMI** identifies the software.
- **Vyzz** identifies the software version. You must read the information as **Vy.zz**.
- **.exe** means that the upgrade file is on executable format.

Procedure

In order to upgrade the MMI software, observe the following procedure.

1 Switch off the PI54.

2 Connect the upload cable between a serial line connector on the computer and the NMEA2 connector on the rear side of the PI54 Operator Unit.

3 Switch on the PI54.

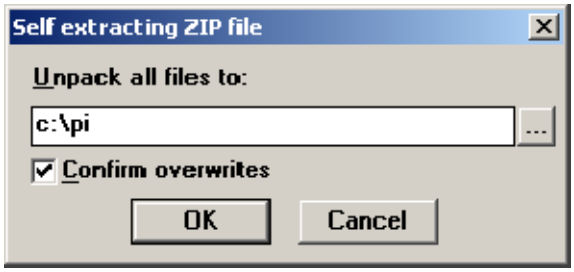
4 Open the *Status display* and leave the PI54 on that page.

5 On your computer, locate the MMI software upgrade file (on **.exe** format).

6 Double-click on the filename to start the execution.

- A small dialogue opens, as the program will unpack the installation files to a dedicated directry.

7 Create or select a dedicated directory for the installation files. Click **Ok** to continue.



8 Allow the installation files to unpack to the chosen directory.

9 Click the **Start** button at the lower left corner of your computer display, and select **Run**.

10 Go to the directory you unpacked the installation files to (Step 4), and select **upload.exe**. Click **Ok**.

- The upload program will automatically detect which serial line port (COM port) you have connected the upload cable to, and that a PI54 cabinet is connected.
- The upload program will further check your current software version. If the current MMI software on your PI54 Operator Unit is newer than the version you attempt to install, it will inform you of this.
- Finally, the upload program will start the data transfer.
- The transfer progress can be monitored in the message field.

11 Allow the transfer process to complete.

12 Switch off the PI54 Operator Unit.

13 Switch on the PI54 Operator Unit.

14 Verify that the new software version is shown in the *Status display.*

Messages

The MMI upload program will keep you posted on the process by means of messages.

Safety measures

The following safety measures have been implemented to minimize the risk of errors during the upload process.

- When the software is uploaded from the computer to the PI54 cabinet, the data are stored in a scratch pad (buffer). The data are not transferred to the Flash PROM (the microprocessor's storage area) until all software data have been transferred correctly to the scratch pad.
- If the upload cable is unplugged, or you loose power on the computer and/or the PI54 cabinet during the upload process, you can simply abort the upload and restart it. Error messages will provide guidance.
- When the PI54 cabinet detects that software is uploaded, it will automatically provide a blank (white) display screen, and the keypad will be locked. It is not possible to switch off the PI54 cabinet during the software upload, except by disconnecting power.

PI DSP Upload

Purpose

The **PI DSP Upload** application is used to upload DSP (Digital Signal Processor) software to the PI54 Operator Unit. The application runs on a standard computer with operating systems Microsoft® Windows 2000® or Windows XP®.

How to install the application

The **PI DSP Upload** application is provided on an **.exe** file. To install, observe the following procedure.

1 Locate the ***.exe** file, and double-click on it to start the execution.

2 Select a temporary directory to save the installation files.

3 Press the **Start** button in the lower left corner of your display, and select **Run**.

4 Select the directory you placed the installation files in, and select **Setup.exe**. Press **Ok** to start the installation.

5 Further guidance is provided by the installation program.

How to run the application

In order to run the **PI DSP Upload** program, you must access it from the **Start** button in the lower left side of your screen. Select **Programs**, and locate the application on the menu.

How to remove the application

If you wish to remove the application from your computer, you must locate the directory where the files are located, and then delete all the files and the directory. The default directory is:

c:\program files\PI DSP Uload

Then you must manually remove the program short-cut from the **Programs** menu. To do this, find the shortcut file and delete it. On a Windows XP computer, you will find this file at the following location:

c:\documents and settings\<your logon>\start menu\programs

Notes

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